The Shambles of Science

EXTRACTS FROM THE DIARY
OF TWO STUDENTS OF PHYSIOLOGY.

179.4
L64S

BY
L. LIND AF HAGEBY
AND
L. K. SCHARTAU.

FOURTH AND REVISED EDITION.

LONDON:
Published by the Authors,
Office No. 12, 32 Sackville Street, Piccadilly, W.

ONE SHILLING NETT.

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DATE DUE DATE DUE
FEB 24 1934
MAY 18 1936
FEB 28 1939
FEB 1946
JUL 12 1947
DEC 14 1948
FEB 3 1986
JUL 02 2008
5-9-18

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They are slaves who fear to speak
For the fallen and the weak;
They are slaves who will not choose
Hatred, scoffing, and abuse,
Rather than in silence shrink
From the truth they needs must think;
They are slaves who dare not be
In the right with two or three.

JAMES RUSSELL LOWELL.

Preface

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PREFACE

> "*While I deeply respect the humane feelings of those who object to this class of enquiry, I assure them that, if they knew the truth, they would commend and not condemn them.*" (From Lord Lister's Speech at Liverpool, October 8th, 1898.)

Our object in taking up the study of physiology has been twofold: first, to investigate the *modus operandi* of experiments on animals, and then to study deeply the principles and theories which underlie modern physiology.

The two are closely related, for the rapid strides on the way of progress, which physiology claims to have made within the

last fifty years, have passed over the bodies of uncountable long-suffering animals.

We are all familiar with the again and again repeated description of the pain involved in experiments on animals as being similar to that caused by a prick of a pin. Words like the above-quoted imply that anti-vivisectionists do not know the truth about vivisection, and that, if they did, they would at once give up their ill-informed agitation, and replace it by a profound admiration for the great men who are engaged in this praiseworthy and unselfish practice.

The contrast between the accounts of the cruelty of vivisectional experiments given by vivisectors and by the opponents of the system is indeed great. We have in vain sought for "the truth" that should change our views in textbooks, treatises, journals in German, French, and English, where experimenters themselves describe their work. Our study of the experimental literature did

not teach us that anti-vivisectionists are mistaken, but, on the contrary, confirmed the justice of the accusations made by them. Was Lord Lister's truth only to be found within the walls of the laboratories? It was not altogether impossible that humbler vivisectors than Lord Lister, when describing their experiments in books and papers, are too shy to dwell on their own tenderness and consideration for the animals, and that they prefer to let the reader guess the indescribable and secret kindness which dominates all their doings.

And so we decided to find out the truth practically. This would also give us the best opportunity to listen to the materialistic and non-moral theories that dominate experimental physiology, as they are proclaimed by some of the foremost experimenters of to-day.

Modern science is infatuated with the glory of its own success, and it too often forgets that verbal classification and nomination

are not always explanation. The intellect has become the sovereign to which everybody bows, and this self-adoring ruler hates to acknowledge the dominions of the heart, the soul, and the spirit, over which he has no power. At no time has a new criticism of the limits of pure reason been more imperatively needed. Physiology is soaring high up in the air like a proud bird of prey. But it carries nothing but the mutilated bodies of weaker and less cruel creatures ; the spirit of life which it tried to catch was too subtle for its murderous fangs.

We desired to study how physiology is taught without and with vivisection. We became partial students of the London School of Medicine for Women, where vivisection is not allowed, and we attended the lectures on physiology there. We then sought and obtained permission to attend various courses of lectures on advanced physiology, and also demonstrations, number-

ing some fifty together, at other laboratories in London.

We have given our full names and addresses and paid our fees. Whenever medical students have spoken to us about vivisection, we have made no secret of our opinions. If anybody had cared to enquire, our connection with the Scandinavian Anti-Vivisection movement could easily have been found out. Our studies in physiology, however, have been entirely private, and carried out independently of any society.

It was not at first our intention to make our experiences public in this way; we only hoped to be able to do our work better with them. The idea of working for a final examination and scientific degree, which we at first held, has been given up, because physiology is at present inseparable from experiments on animals, and nobody objecting to them could have any chance of obtaining a degree.

We now think that some of the things

we have heard and seen in England may be of interest to English anti-vivisectionists, and we have therefore decided to compile part of our notes and reflections and to publish them.

Vivisectors are extremely anxious to spread their ideas among the young students, and they are not in the least ashamed of their teachings. They ought, therefore, not to object to these comments on their doctrine by two *very* attentive pupils. The names of the lecturers and demonstrators have been omitted in the accounts of the experiments, as this is not meant to be a personal attack, but an indictment against the system.

The importance of personal experience of the methods of vivisection for those who throw themselves heart and soul into the battle against it cannot be exaggerated. We hope that more and more ardent friends of this cause of mercy will enter the laboratories, see the deeds of darkness tolerated

in Christian countries, and tell the world what they have seen.

To fight against vivisection is to fight against the principal fortress of the foe of idealism and spiritual evolution.

Not until this fortress lies shattered, and even its ruins are removed from the face of this earth, can we justly claim to possess civilisation.

April, 1903.

PREFACE

To the Fourth and Revised Edition.

A great number of people have expressed their wish that "The Shambles of Science" be again obtainable. We reprint it in a revised form, honestly believing that a book which is not an attack on individuals, but a record of personal experiences of a method of instruction and scientific education, which to an ever-growing section of the public is becoming a matter of grave social and moral importance, has the same right to exist and to express the opinions of its authors as have the various literary expositions of the many movements afoot on the paths of Reform, which are characteristic of a free age and a free country.

In publishing this book our intention was never to stigmatize *persons* and it is a matter of regret to its authors that this book should have been mentioned in connection with the

work of one vivisector, a consequence of the libel action which was altogether undesirable. The names of places and dates were retained; not with the intention of holding up a few of the many licensed institutions as specially condemnable, but as a guarantee against the conclusion which otherwise only too readily would have been drawn: viz., that these experiments could not take place within the walls of well known institutions but that the descriptions given were those of imaginary abuses. In order to emphasize our desire to inveigh against the system only we have now removed these indicative references from the diary of our physiological studies. Moreover the reason for their insertion has been removed. The public now know a great deal about everyday vivisection before students. There is now very little need for us to name special laboratories; the public is no longer ignorant of the character of the demonstrations which take place before students.

The Clause of the Vivisection Act which provides that only experiments which are

"absolutely necessary" are to be performed before students, has been proved to be a dead letter.

The intention of the Act is obviously to protect students from witnessing too much vivisection and the very existence of the Clause is a recognition of the moral dangers of vivisection as a means of education. The opinions on this matter held by leading vivisectors were elucidated from Sir Victor Horsley, who in giving evidence to support Mr. Bayliss at the Bayliss v. Coleridge trial expressed his opinion that there should be no lack of animals sacrificed for "education" and who, when asked, "without any limit?" answered: "No limit."

The prospect of limitless vivisection before students should command the attention of all who are engaged in educational, social, moral, and truly scientific work.

It has been said (with some truth) that it is better to rely upon the descriptions of experiments on living animals given by vivisectors themselves in scientific journals than upon the accounts of eye-witnesses, who having

become opponents of vivisection, will always be labelled "biassed," "faddists," or "hysterical" by the pro-vivisectionistic party.

It must, however, not be forgotten that the frank confessions of a Mantegazza, a Cyon, and a Klein are not likely to be repeated openly by men who may hold the same opinions, but who have to submit the descriptions of their vivisectional ardour to the humane pressure of the time. The anti-vivisection agitation has grown very troublesome, and the records of research work given by vivisectors themselves will day by day become more decently clothed in anæsthetics and narcotics.

Since the first publication of this book those who wish to be convinced by the revelations of vivisectors themselves have had a unique opportunity of learning facts about vivisection from the sworn evidence of prominent experimentalists. The story of the thrice vivisected brown dog as told by its vivisectors to the Lord Chief Justice and a special jury, and as it is found in the

verbatim report of the trial, proved the true nature of vivisection far better than the chapter "Fun" which can now be dispensed with. The vivisectional hooliganism, to which attention was drawn in that chapter, was demonstrated in Court, where the youthful champions of vivisection, who filled the gallery, gave most demonstrative evidence of their manners and ideals.

"The Shambles of Science" consists of descriptions of a series of independent experiments. One chapter only has become associated with the trial. With the omission of this chapter all such connection ceases. The reason why the book has been temporarily withdrawn is that the verdict for the Plaintiff naturally gave the winner of the case power to suppress that chapter and the copies that contained it.

During his summing up, the Lord Chief Justice in referring to "Shambles of Science" passed comment upon the non-libellous character of the book in making the remark "the book is not libellous."

The need for a book of this kind was

evidenced by the reception accorded to it on its appearance by the Press. During a period of barely four months there were more than 200 reviews and notices, of which not 20 were adverse, in daily papers, weekly journals and monthly magazines of widely different views throughout the United Kingdom. At the International Congress against Vivisection, held in 1903 at Frankfurt a/Main, it was decided to send a copy to the German Emperor and another copy accompanied by a letter afterwards printed in "Towards Freedom," has been sent to King Edward VII by Lady Florence Dixie.

Among the letters that have been written upon "Shambles of Science" expressing sympathy with the cause against vivisection there has been one which our friends have expressed a desire that we should have publicly answered. This was a letter by Dr. Greville Macdonald, dated Nov. 19th, 1903, which was published in several London papers.

Our reason for not having answered this letter is that the writer leaves the ground of

fair controversy and resorts to the not unusual method of allowing professional orthodoxy to condemn opinions which are not orthodox, but which have a perfect right to exist. The writer of the letter is quite entitled to hold his opinions upon "Shambles of Science," but when he goes on to say, as he does in the latter part of his letter that our claims (with regard to reflex action in frogs) "are no less absurd than those of one who argues, for instance, that the earth is flat," we cannot but wonder at the superficial criticism of a problem which, sooner or later, and in spite of ignorant prejudice, must be acknowledged as a problem by the "intellectually honest world." We have witnessed operations upon patients under chloroform and experiments upon brainless frogs, and the phenomena exhibited by both have taught us to look a little deeper into that chaotic part of physiology, involving the study of many important vital phenomena, which is roughly classified as "reflex action" and implicitly accepted by the intellectually conservative and contented.

The vivisection controversy can less than ever be looked upon as a question of "sentiment" on the one hand and "science" on the other. The false reasoning, which leads to a form of biological research which of necessity destroys the very conditions it should investigate, is being severely criticised by minds of highly intellectual capacity. There have been of late several signs of a healthy reaction, which is not guided by sentimentality but by rationality, against the crude forms of investigating the living body which are more suggestive of a slaughter-house than of a scientific laboratory.

The average medical student has not the courage to oppose well accepted theories, and knowing what human nature is, we cannot wonder at the reticence shown by many who secretly do not believe in vivisection, but who dare not speak in face of the enormous pro-vivisectionistic bias pervading the profession, without the approval of which they would find it difficult to gain their future living. Everything should be done to encourage the true study of biology in minds

that are independent and unfettered by existing fashions, and in a position to speak freely on the subject. Truth, whether in physiology or in other sciences, cannot be shut out from the garden of knowledge by "Vivisection Limited" or any other syndicate, steeped in prejudice and financial interest.

In conclusion we beg to express our sincerest thanks to all friends who so kindly have shown their sympathy and interest in this book and our warm appreciation of the Address which we append. When lecturing in London, and in many other parts of England, we have been deeply moved by the marks of confidence in our work, and the whole-hearted support which we have met with everywhere. It has been proved beyond all doubt, for which assurance we are very grateful, that recent events which seemed likely to injure the Anti-vivisection Cause have on the contrary greatly strengthened and extended it.

May, 1904.

The following address has been presented to

Miss Lind=af=Hageby

AND

Miss Schartau

Authors of "The Shambles of Science."

We offer you this Address as an expression of the sympathy and respect with which we have noted your behaviour during the ordeal of public cross-examination which you have undergone in our Law Courts. The courage with which you gave your evidence amid the unchivalrous interruptions of the Vivisecting party commands our warmest admiration.

We also wish to assure you of our unabated confidence in the veracity of "The Shambles of Science"; and we hope that so valuable a body of evidence may not long be lacking in the armoury of the opponents of scientific cruelty.

We congratulate the great Swedish Anti-Vivisection Society on having such honourable and honoured representatives as you have proved yourselves in England.

The address has been signed by the following, amongst others :—

The Lady Victoria Campbell.
The Princess Mele Barèse.
The Earl of Albemarle.
The Earl and Countess of Aylesford.
The Dowager Countess of Darnley.
Viscount Harberton.
Lord Leigh.
The Very Rev. the Dean of Durham.
The Hon. and Very Rev. the Dean of Hereford.
The Very Rev. Herbert Story (Principal of Glasgow University).
The Very Rev. James Watson Reid (late Dean of Glasgow and Galloway).
The Rev. Canon Hughes.
The Provost of Helensburg.
The Hon. Seymour Ormsby Gore, M.P.
Colonel T. Myles Sandys, M.P.
A. Osmond Williams, Esq., M.P.
J. Bryn Roberts, Esq., M.P.
Sir James Colquhoun, Bart.
Lady Paget, Lady Kemball.
Sir Charles and Lady Skelton.
The Hon. C. D. Finch.
William Roscoe, Esq., J.P.
R. Lloyd Price, Esq., of Rhiwlas.
Mrs. Price.
Dr. Paul Förster (Berlin).
Deputy Surgeon-General J. H. Thornton, C.B.

Rev. Dr. Campbell Strickland.
Mrs. Bunting.
Herbert Philips, Esq., J.P.
Mrs. Philips.
Rev. Montague Welby (Fellow of Magdalen College, Oxon).
Mrs. Montague Welby.
Mrs. Tollemache.
Rev. Henry Ricketts.
Mrs. Paisley.
Miss Edith Carrington.
Mrs. and Miss Ffoulkes.
Col. Hutton.
Miss Helen Bourchier, M.D
Mrs. Edwards of Dolserau
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Alfred Phillips.
Ed. M. Phillips.
F. G. Mitchell, Esq.
C. J. Reiglen, Esq.
Miss Frances Power Cobbe (President of the British Union for the Abolition of Vivisection).
John F. Norris, Esq., K.C. (Hon. Treas. of the British Union).
Mrs. A. Muriel Roscoe (Hon. Sec. of the British Union).
Rev. Dr. Warschauer (Lecturer to the British Union).
Rev. John Verschoyle (Hon. Corresponding Secretary of the British Union).

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The Death of Vitalism

. . . . . "for pity makes the world soft to the weak and noble for the strong."

SIR EDWIN ARNOLD.

The Light of Asia.

THE DEATH OF VITALISM

ARMED with scalpel, microscope, and test-tube, the modern physiologist attacks the problems of life. He is sure that he will succeed in wrenching the jealously-guarded secrets of the vital laws from the bosom of Nature.

Old-fashioned physiologists were not so afraid of admitting that in their studies of the functions of the living body they often had to turn away from problems which cannot be solved by the experimental method.

But the "reverent study of Nature" is ridiculous to the physiologists of to-day. The "animal machines" are as yet somewhat intricate, and the laws that govern these machines are not so exact as the physiologists would like, but still they are confident that

one day they will have penetrated the depths of the phenomena of life. They only want millions more of animals to experiment upon, better knives, better operation-holders, more powerful microscopes, finer electrical batteries, and they are sure the victory will be theirs. They may even cherish the secret hope that one day a real Frankenstein will arise from among the ranks of prominent physiologists.

In the Croonian Lectures for 1901 Professor Halliburton says:

"We sometimes speak of physiology as the application of the laws of chemistry and physics to life. Since this conception of the aim and object of physiology has pervaded its disciples, the progress of physiological knowledge has been rapid and fruitful.

"When Helmholtz, Ludwig, and their contemporaries set themselves to rescue our science from the slough of mysticism, they placed it on a firm basis and no doubt hoped in time to be able to expunge the word 'vital' from their vocabulary. But all must admit that that time has not yet arrived.

The neo-vitalists, it is true, have not the same contented and reverent frame of mind in relation to the meaning of the word 'vital' as the older vitalists had. They admit its unsatisfactory and *unscientific* nature; they use it merely as a convenient expression for what *cannot at present be brought into line with the forces that operate in the inorganic world*,[1] and not merely as a cloak for their ignorance. The use of this word becomes most frequent when we have to deal with mental phenomena, and the question for the future is whether the manifestations of vitality are only physical and chemical after all, or *whether there is really some other and at present unknown force, or unknown aspect of known forces*,[2] which in the meanwhile we must be content to label as vital.

"On such a fundamental question as this there is obviously much room for differences of opinion. The answer is certainly in the region of the unknown; some may place it with du Bois-Raymond in the region of

[1] Italics ours. [2] *Ibid.*

the unknowable. That may be so; one hopes that it is not, for if we once admit that any subject is unknowable, we place an impenetrable bar upon research, and remove any stimulus to investigate it afresh."

The new school which regards physiology simply as a sort of physico-chemistry is indeed quite free from "the slough of mysticism." In emancipating themselves from the old vitalistic and reverent views, the adherents of this school have also expunged the unscientific and misty attributes of mercy and kindness towards inferior creatures which are coveted by less advanced men.

The result of all their experiments is a philosophical retrogression; they have returned to the theory of Descartes, and reduce animal life to a kind of machinery, the springs and screws and wheels of which will be revealed by their latest improved instruments. They seem to be especially influenced by the Cartesian doctrine, that animals possess neither feelings nor consciousness.

The "exact experimental analysis of physiological phenomena" cannot be concerned with feeling, and the mechanical explanation of life is quite free from religious superstition.

A host of disbelievers in experiments on living animals as being the means of true physiological knowledge held the vitalistic views. Among them, the famous naturalist Cuvier deprecated the method of physiological research which is now accepted by physiologists of the twentieth century as being the only reliable one.

Vitalism stands in the way of "the rapid and fruitful progress" of vivisection and materialism, and therefore vitalism has to be killed.

Experimental physiology is triumphant over its new faith, which places the phenomena exhibited by living and non-living matter equally within range of its physical and chemical apparatus.

To tear living beings to pieces, to analyse the properties of the warm blood that spurts out from lacerated vessels, to mince the

twitching muscle and squeeze its fluids for the test-tube, to cut vibrating nerves, to bring disorder and disharmony into the perfectly united parts of the living body, are now the highest forms of this science.

It is only natural that scientists who investigate the living organism in this way find nothing that is alive as it was. They measure the physical and chemical manifestations of their material; they do not recognise the vital—they have no instruments with which they can pick up that; and, besides, every physiologist of rank in these days despises the idea of a mystical something which does not make obeisance to his genius.

The skilled mechanician is master of the laws which he thoroughly understands; the experimental physiologist is master of Destruction, but he is mastered by Creation.

It is indeed paradoxical to worship a physiology deprived of "vitalism"; the results of such a science are also paradoxical and dead.

"Painless Experiments"

"I should have been very sorry not to join in the Protest against this hideous offence, and am truly obliged to you for furnishing me with the opportunity. The simultaneous loss, from the morals of our "advanced" scientific men, of all reverent sentiment towards beings *above* them and towards beings *below*, is a curious and instructive phenomenon, highly significant of the process which their nature is undergoing at both ends."

JAMES MARTINEAU.

From a letter to Miss Cobbe.

See *Life of Frances Power Cobbe.*

"PAINLESS EXPERIMENTS"

The lecturer takes out a frog from the small box where they are kept. He inserts one point of a pair of forceps under the skin behind the skull for a moment. He now informs us that he has destroyed the brain and that the frog cannot feel pain any longer. He then takes a pair of scissors and proceeds to divide the spinal cord; but when the sharp edges of the scissors penetrate the skin, the animal begins to struggle, quickly moves its limbs to its back, and tries with hands and feet to thrust away the instrument.

But the little hands are of no avail. There is a crunching sound, the spinal cord is cut across, and we all observe the "general loss of tone" which is the immediate result of the operation.

Have you ever noticed how extremely childlike the hands of a frog can be, and what a pathetic look can meet yours from that quaint little face?

Another frog is taken out of the box, and, with a pair of scissors, the lecturer cuts off the upper jaw with the anterior part of the skull, and the wound is cauterised. The two frogs are motionless on the table for a few moments. The lecturer continues to speak about the influence of the nervous system upon the regulation of temperature, and the above demonstrations have been made to illustrate the effect of lesions on the nervous system.

But we cannot help looking at the frogs and the isolated head on the table. The decapitated one begins to jump about; it gets too lively; with one big leap it reaches the floor, and it looks as if it tries to escape. But the laboratory boy has observed the fugitive. It is caught and put under a glass, where it remains until the end of the lecture. Inside the glass the animal is just as troublesome. We see it making vain efforts to

climb the smooth walls of the vessel. It is an unpleasant sight to see the little mutilated creature dancing inside the glass, like one of the unhappy whirling spirits which mediæval sorcerers claimed to have imprisoned in bottles. Though the movements, of course, are "pure reflexes," it is still thought that they may produce disagreeable reflections in some of the audience, and the glass is accordingly covered with a cloth.

After the lecture interested students go to look at the animals that have been used for demonstrations. Besides the two frogs there are hedgehogs, dormice, and a rabbit, which, after having inhaled some ether, was put in a freezing-machine where a big piece of ice had been put previously. The rabbit was forgotten and left too long in the box, and when it was taken out after fifty-five minutes, it was found to be "beyond the stage for observation."

In order further to illustrate reflex action, the lecturer, with some remarks on the ignorance of laymen who associate movement with conscious sensation, picks up the frog

that had tried to rub off the scissors from its back. To our astonishment he again inserts an instrument into the skull cavity of the frog, moves it round several times, after which he says, "Now the brain is thoroughly destroyed." What, then, about the first destroying? He now cuts off the right arm of the frog, whilst the animal tries to push the scissors away with its left arm and feet. The left arm is then severed from the body, whilst the feet fight to save it. Piece by piece is cut away, till at last the demonstrator has finished, and throws down the little bleeding piece of frog which remained in his hand. It falls down just in front of the rabbit, which has been crouching on the table since it was taken out of the freezing-machine and put there, quite conscious but frozen stiff, like a piece of wood. With all signs of terror the animal springs back, trying to get away, but, half-paralysed by the cold and half-fascinated by the uncanny thing, it falls down again with its glazed eyes riveted upon the bleeding and twitching "reflexes" of what was once a frog.

It is doubtful whether it ever occurs to physiologists that frogs were made for anything but experiments.

The above demonstrations were made by a well-known lecturer on physiology, although, as he told us, he had not at that time a licence for that laboratory, nor was he quite sure whether the laboratory was registered or not. Not to discuss the legality of the experiment on the rodent, nor for the moment these particular operations upon frogs just described, which, according to the once-established dogma, are painless, we are quite sure that there is many a scientific breach in the laboratories against the popular notion that frogs are vertebrate animals.

Blood-Clotting

Queen— —" I will try the forces
Of these thy compounds on such creatures as
We count not worth the hanging (but none human),
To try the vigour of them, and apply
Allayments to their act; and by them gather
Their several virtues and effects."
Cornelius— " Your Highness
Shall from this practice but make hard your heart;
Besides, the seeing these effects will be
Both noisome and infectious."

SHAKESPEARE.

"Cymbeline," Act I., VI.

AN EXPERIMENTAL PRODUCTION OF BLOOD-CLOTTING BY INJECTION OF A NUCLEO-PROTEID

An operation-table is carried into the room, on which a grey rabbit has been stretched on its back. Its four feet are tied with strings which are drawn down into slits in the table. The head is partly fixed by some screws, but not sufficiently to prevent the animal from moving it. The throat has been opened, the jugular vein exposed, and a cannula inserted. This cannula is now connected to a tube through which the nucleo-proteid is going to be poured into the vein. Have these preliminary operations been done under an anæsthetic? The lecturer is assisted by another physiologist, who now places himself on a small stool in front of the rabbit's head, and repeatedly

pours a solution of ether on a cloth, which he lays over the rabbit's head. The anæsthetist looks most careful, as if he were attending the precious life of some human patient, and to many this would be a perfect and satisfying demonstration of the extreme care, nay love, with which the animals are treated in the laboratories. These moments have fixed themselves in our memory with a persistency that can only be explained by the fact that it is the only time that we have witnessed such a tender ministry.

The lecturer is standing near the animal that is being anæsthetised; there is a profound silence and stillness. Only the rabbit moves its head and fore-paws once or twice. At last the lecturer says: "We are looking to the important part of giving an anæsthetic; ether is being administered, which takes some time and must be done carefully, because one does not like one's animal to die from the anæsthetic."

We must confess that the explanation why it has to be done carefully does not fulfil our highest hopes.

The rabbit does *not* die from the anæsthetic; it is time to begin the demonstration. The lecturer and the anæsthetist exchange some remarks that seem to be very pleasant, and laugh.

The professor tells us that it is quite possible that the experiment will fail. The nucleo-proteid has been prepared from a kidney. The kidney has been ground up with common salt in the usual way, distilled water added, and the whole put in a tall cylinder. The nucleo-proteid then rises up to the top of the cylinder in strings. It is collected with a teaspoon and then filtered.

This nucleo-proteid has now been placed in connection with the cannula in the jugular vein in the rabbit, the lecturer turns a kind of tap, and the nucleo-proteid is allowed to run into the blood. We see the liquid slowly sink in the long tube. After a few seconds the rabbit begins to struggle as much as it can with its tied feet; it is then thrown into tetanic convulsions for about a minute, the eyes become bloodshot and start from their sockets, and the animal falls back—dead, as

it is declared, from intravascular clotting. The lecturer lifts up the rabbit's head to show us the protruding eyes, but behold, the "dead" animal begins to struggle. "Oh! lifting the head acts as a stimulus," explains the demonstrator, and adds: "We will wait a few moments before we demonstrate the clotting." He does not wait long enough. The animal is still moving when its thorax and abdomen are ripped open. With his forceps the lecturer pulls out a well-formed clot from the aorta, then one from the portal vein. We see the heart still beating, in vain trying to send the now artificially solidifying blood through the vessels. But the scalpel is the stronger of the two; a few cuts, and the lecturer holds the trembling heart in his hand and pulls out the largest and finest clot from its interior. The experiment has succeeded and the students applaud.

Now, was the rabbit anæsthetised or not? The moment after the nucleo-proteid had entered the vascular system, the animal began to struggle violently. And would not the tetanic spasms that followed counter-

act the effect of a possible anæsthesia? The animal was not motionless even before the injection.

The lecturer told us that the same effect would not have been produced in a dog, and that colour has a deep significance. He said that he had in vain tried to get a black rabbit for this experiment. As this rabbit was grey he had not been quite sure of success. It would have been impossible to produce this clotting in a white rabbit or in the arctic hare.[1] And he added: "This shows how little we know about clotting."

[1] The difficulties that beset the path of the experimental physiologist are indeed great. The blood of the white rabbit refuses to clot, whilst it clots beautifully in the black. In Mr. Sandeman's "Problems of Biology" we read of a kind of reversal of black and white, for, according to Hensinger, "white sheep and pigs are injured by certain plants, whilst dark-coloured individuals escape."

The Quiet Cat

"Vivisection is a crime; it can only be excused by hypotheses, and hypothesis as a basis for such a practice is horrible and shocking. . . . . The science which uses it as a pretext is culpable. . . . . The human race must repudiate such barbarous practices."

VICTOR HUGO.

Speech to a deputation, February 3rd, 1884.

THE QUIET CAT

We once saw a marmot, the spinal cord of which had previously been divided, bite a vivisector. His finger was bleeding a little, and he tied his handkerchief around it and looked a martyr.

"Are they not nasty animals? You have to be careful of them," said another vivisector, who was engaged in cutting up mice. And the nasty unscientific animal was accordingly removed to a safe place.

The black and white cat destined for to-day's experiment has no doubt also been nasty, for he is very firmly fixed to the operation-board with paws in leg-holders and head in a fork. There is a bar in his mouth, and the jaws are squeezed together by a string tied round them. He may have tried to scratch the noble specimen

of the superior human race who tied him to the board—you cannot expect better behaviour from a cat.

Now he is not at all dangerous to the scientific ladies and gentlemen who are going to increase their wisdom by looking at his kidney and the measurement of its secretion. There is an incision in the left side of the abdomen, and the kidney has been put into an air oncometer. There is also a longitudinal median incision which opens the whole abdominal cavity, and a double cannula, simultaneously collecting the flow from the two ureters, has been inserted. The neck is also cut open. There is an apparatus for recording the blood-pressure and the rate of secretion of the urine; cannulæ everywhere, one in the opened trachea, and artificial respiration is maintained, which leads to the conclusion that curare has been used, for there is no operation performed which makes artificial respiration necessary to prevent the animal from dying.

Several experiments intended to produce changes of the blood-pressure are made in

order to show that the secretion of the urine is smaller or greater, according to the rate of the flow of the blood through the kidneys. But these experiments fail altogether. The lecturer gets very nervous, rushes to and fro, touches a screw here, pulls a cannula there, pokes the quiet cat, abuses the apparatus, whilst the secretion from the kidney demonstrates its entire independence of the changes believed to take place in the volume of the kidney. Something has again gone wrong with the recording apparatus. The spectators do not trouble much about the inaccurate apparatus. Right or wrong, success or failure, an experiment upon a living animal is always interesting, and they reward the zealous demonstrator by applause and laughter.

A sample of blood is taken from the cat and mixed with water in a tube; a solution of sugar is then injected into the jugular vein, in order to show the great difference thus brought about in blood-pressure and in secretion. But the blood-pressure record is again faulty. The demonstrator examines

the instrument to find the cause of this; but the Blind Chance governing the atomic processes in the apparatus, in the cat, and in the hands and brain of the experimenter, is ungracious, and nothing is discovered which can explain the mischief.

Some more blood is then drawn from the animal and mixed with water in another tube to let us see the changes after the sugar injection. A storm of applause breaks loose when the doctor now holds up the two tubes, and successfully demonstrates the difference in the colour of the two liquids. This was the *clou* of the performance.

It is not worth while to demonstrate anything more on the cat. It is still perfectly quiet, and is, therefore, allowed to remain where it is till the lecture is over. Students then flock round the animal and shake the instruments to see if they are all right or wrong. They especially find the double ureter cannula fascinating, and the lecturer, who is a very amiable teacher, and who is very proud of this glass tube, is anxious to let them see it clearly. He tries to untie

the thread holding it, but that is too wearisome, and so he takes up a knife, cuts off the tissues to which the cannula is tied, and then holds it up to let us all see how ingeniously it is made. The spectators left after an hour and a quarter.

They descended the stairs chatting and laughing. It was a fine evening, and the change from the heavy laboratory atmosphere was welcome. It is nice to have taken part in some important scientific work, and to feel how one's knowledge and intellectual worth are growing.

But the cat lay as it had lain when they entered.

Scarcely Any Anæsthetic

" And so, amid the laughter gay,
Trotted my hero off—old Tray—
Till somebody, prerogatived
With reason, reasoned: 'Why he dived
His brain would show us, I should say."
" 'John, go and catch—or, if needs be,
Purchase—that animal for me!
By vivisection, at expense
Of half-an-hour and eighteenpence,
How brain secretes dog's soul we'll see!"

BROWNING.

"Tray."

SCARCELY ANY ANÆSTHETIC

The tools of the experimental physiologist are many. The simple scalpels, scissors, forceps, pincers, knives, hooks and saws, with their concomitants of cotton wool, sponges, threads of silk, vaseline, etc., which are spread in rows on the glass slabs in front of us, are only some of the cheapest and simplest requisites of the humble artisan in the trade of vivisection. Nor do the various forms of animal holders, operation-tables, and boards with different kinds of head-holders finish the equipment of even "un petit vivisectorium." Much labour, thought, and study are devoted to the improvement and invention of these, and scores of workmen in the great centres of our Western civilisation are employed in the manufacture of apparatus for holding live animals, but all the same, they are only the most elemental necessaries of everybody who

nowadays is engaged in experiments upon animals.

There are the many forms of physical instruments in constant use, the different kinds of batteries, coils, electrodes, galvanometers, and all the paraphernalia of electrical stimulation and electro-physiology, the various forms of apparatus for keeping up artificial respiration, for recording blood-pressure and respiration, of cannulae, chronographs, tambours, manometers, plethysmographs, etc., all of which are constantly "modified" and added to.

The old "masters," if they rose from their graves, and were placed in a modern laboratory well fitted for new research, might be deemed veritable simpletons because of their ignorance of the complicated apparatus now used. They might even have to be told by Mr. Stephen Paget that "physiology in the present is wrought to finer issues," and that "it is impossible to have back the simpler problems of the past."[1]

The methods of a Magendie and a Claude

[1] "Experiments on Animals," by Stephen Paget.

Bernard, who lived at a time when "experimental physiology was looked down upon,"[1] and were in great want of adequate laboratories, and who "had need of a real passion for their science," and who were "denounced and given over to the reproaches of neighbours and subjected to annoyances by the police," were natural and simple compared with those now current on the market of fame.

The apparatus used in the present demonstration combines the latest improvements for recording blood-pressure.

A white fox terrier has been tied down to the operation-table. It is laid on its left side, and its muzzle is kept closely shut by a piece of string tied round it to a bar placed behind the canine teeth. There is a wound in the head, about six centimetres in diameter, that is bleeding profusely. The skin and muscular tissue have been removed, a hole bored through the skull, and a short metal tube, reaching to the flexible membrane screwed into the bone.

[1] "Claude Bernard," by Sir Michael Foster.

There is also a large incision in the neck, and a cannula, attached to a mercury manometer, has been inserted into the carotid.

We are now going to study the circulation in this dog's brain by recording the blood-pressure. It is, therefore, a little discouraging to be told from the outset by the lecturer that "this demonstration will show that we cannot judge of what is going on in the brain by recording the pressure."

The strings which hold the dog's legs are loosened, the assistant demonstrator lifts up first the hind-legs and then the body several times, whilst the lecturer holds down the animal's head. The lever which indicates changes in the cerebral circulation now records a rise in blood-pressure. This is very valuable information, but any person who has picked up a pin from the floor, and any boy who is accomplished in the art of standing on his head knows this without opening dogs' skulls. But to the born vivisector even the familiar experiences of every-day life cannot be credited unless they have been tested by experiments on animals.

"The animal is so profoundly under morphia, we have scarcely had to give it any anæsthetic at all," says the lecturer. Though everybody knows that morphia is not an anæsthetic, it is made the cause of many a game of hide and seek between experimenters on animals and anti-vivisectionists.

The hour is now consecrated to "stimulation." The veins are stimulated: there is a rise in the vena cava pressure; one vagus is cut, and the effect of stimulation after this studied; then the other vagus is cut, and the result of a new stimulation noticed. Now and then a quite unexpected effect occurs; the demonstrators take it easy, laugh and make the spectators laugh, or reassure us with "it may be due to a clot or it may be due to a defect in the mechanism."

When the lecture is over we all go to study the apparatus and the dog closely. It is a fine little terrier, with a clean, thick, glossy coat, as white and trimmed as if it had had a bath and a good brushing this

very morning. There are brown and black spots on the muzzle and the ears. The lecturer wishes to show us clearly the tube in the skull. There is a severe hæmorrhage, and he must repeatedly put a sponge into the hole in the head to soak up the blood before we can see clearly. He then pulls the screw to let us see how securely it is fastened, then unscrews the tube to demonstrate its mechanism, but he is not very careful and drops the screw. It falls into the open wound on the head, is picked up, and after having been inspected it is again screwed in.

Some of the students exhibit such a keen interest in the experiment that the lecturer decides to start stimulation again.

We now stand just in front of the dog's head. The left eye is squeezed together against the table; when we bend down to look closely at the right one there is a look of the utmost agony in it. He opens and shuts that clear brown eye several times, and never shall we forget the expression. No words could picture so faithfully the

horror and the torture which the slaves of a damnable science are made to endure.

The electrodes are now again applied to the nerves in the opened neck, and with each shock the dog's body shakes and shivers.

When we left, after an hour and twenty minutes, the dog was still alive. Nobody made any arrangements to disconnect his body from the blood-pressure and electrical apparatus, and probably he would have to be employed for some more "work."

Most of the students evidently enjoyed this lesson very much, but there was a physiologist present who, to our great happiness, expressed the thought "that it was very unkind to stimulate it painfully."

Alas! we must ask: where is *kind* vivisection?

Not Supposed to be Useful

"Nothing can justify, no claim of science, no conjectural result, no hope for discovery, such horrors as these. Also it must be remembered that whereas these torments, refined and indescribable, are certain, the result is altogether conjectural—everything about the result is uncertain but the *certain infraction of the first laws of mercy and humanity.*

CARDINAL MANNING.
Speech, June 21st, 1882.

AN EXPERIMENT THAT "IS NOT SUPPOSED TO BE USEFUL"

THE "plethysmographic" method of studying the circulation through an organ is extremely popular just now. By a plethysmograph, or oncometer, is meant a special kind of box made of wood, glass, or metal, into which the organ to be studied in the living animal is enclosed.

The original oncometer was invented by Roy for experiments upon the kidney, and consisted of a double metal box with a membrane fitted on loosely inside. The apparatus having been made air-tight and oil-tight, the space between the membrane and the inner halves of the box was filled with oil, there being sufficient space left for the kidney. When the kidney had been introduced into the oncometer, expansion

of the kidney would drive the oil out of the apparatus, which was connected to a recording instrument called the oncograph, the lever of which would rise and sink again when the kidney contracted.

The oil oncometer, however, has become old-fashioned, and is substituted by the air oncometer connected to a tambour. This form of oncometer is more convenient. It consists generally of a simple box made of varnished wood or glass, and has a lid of thick plate glass; there is a notch in the box through which the vessels and nerves pass when an organ is enclosed. The interior of the box is made air-tight by wool soaked in vaseline and paraffin. When the organ expands, the air is driven out of the box, and the changes in volume are thus recorded by the lever of the tambour.

Oncometers are now very much used in experiments on different organs. The development of the plethysmographic method, and the rising passion for shutting in everything in boxes to catch its life, is a good example of the entire indifference for any

natural conditions which characterises modern experimenters in physiology. They often acknowledge that the shut-off organ is in an abnormal state, and are also well aware of the fact that all the nerves of an organ cannot always be made to enter the box, and that the effects recorded are therefore, even from their point of accuracy, partial. But the dissimilarity is passed over as a negligible quantity; indeed, all discrepancies in their methods are negligible quantities, and the craze for plethysmographs everywhere is growing with a rapidity and faith in their efficacy that would be charming in its childishness if it did not involve torture on innumerable animals whose bodies must give the material for the all-devouring plethysmograph.

The question of the innervation of pulmonary vessels has been studied by many observers, especially by Bradford and Dean and by François Franck, who all, after many experiments with recording the blood-pressure, division and excitation of nerves, came to the conclusion that there was a

nervous control over these vessels. Dr. T. G. Brodie and Dr. W. E. Dixon wanted to confirm these results, and took up the question again, and were pioneers in using the lung plethysmograph. Lungs in boxes now taught them that the results of the former investigators were all wrong, and that the pulmonary vessels were not innervated. The lung oncometer, however, was not altogether satisfactory, as the heart could not be made to work with perfect uniformity during the whole observation, so they tried other methods, perfusion experiments, and after having availed themselves of apocodeine and adrenalin, confirmed their own theory that the lung vessels had *no* nerve supply. And there the theory will stand until somebody else is good enough to wish to confirm the theory of Messrs. Dixon and Brodie, when probably it will fall to pieces. For "truths" in experimental physiology are as ephemeral as the life of a butterfly.

The lecturer is now going to demonstrate the application of the plethysmographic method to the circulation through the lungs.

A large-sized brown mongrel dog has been fixed to the operation-table on its back. A piece of strong string is tied round the muzzle and keeps it closely shut, the chest has been opened widely, the sternum cut through and the ribs removed; the lungs are exposed, and artificial respiration kept up by means of a pump attached to the operation-table and worked by electricity. A lobe of one of the lungs, the bronchus of which has been plugged with cotton-wool soaked in vaseline in order to prevent any air entering, has been introduced into an oncometer filled with vaseline and closed by a glass lid. Before one can put the lobe into the oncometer, one must hold the lobe between the fingers and press it gently until the air is driven out. There are cannulæ in the pulmonary artery and in the aorta, and the blood-pressure in both will also be studied.

The lecturer informs us that this will be a demonstration rather than a lecture, although "demonstration experiments notoriously do not go as they should go." He also admits that the shut-in lobe is in

an abnormal state which may affect the flow of blood, but encourages us at the same time by saying that we shall try to avoid that difficulty.

The abdomen is first pressed, the three levers denote a marked rise of blood-pressure in the pulmonary artery, in the lobe, and in the aorta. *In a cat this effect would have been much more marked.* . . . Longer and harder pressure on the dog's abdomen; all three levers now indicate a fall. "The animal is deeply under morphia," says the lecturer. We can be almost certain that the dog has been also curarised, because it is absolutely still with the stillness that is characteristic of the "hellish woorali." We watch the regular blowing out and collapsing of the lungs, and listen to the hissing sound of the blast of air forced into the trachea. The heart is stimulated, one vagus is stimulated, there is a fall in the pulmonary and aortic pressure, whilst the lung volume is diminished. A clot has to be removed. Supra-renal extract is now injected: we ought to get a big pulmonary constriction,

but it does not appear as soon as it should. Another clot has to be removed. "Pulmonary arteries are always troublesome and liable to clotting—why, we do not know," explains the demonstrator. The first effect upon the lungs is now a diminution in volume, the pulmonary artery shows a slight fall, then a rise again, then a fall again as the aortic pressure also falls. (If the reader should think that these interesting rises and falls are rather in a muddle, and if he be not sufficiently cultivated to take a keen interest in them, and be grateful for the information here given, we beg of him sincerely to mend his manners and to follow us patiently a little longer into these deep studies, the fruits of which the world surely could not do without.)

A dose of atropine is injected to cut out the inhibition due to the supra-renal, and look here, there is a cardiac acceleration; up goes the pulmonary pressure and the lung volume. The volume change is rather small to-day; *it is commonly much more marked.* Besides, remember, *it is never so*

marked in a dog as in a cat. A second dose of supra-renal is now injected, and this time we expect a bigger rise in blood-pressure, but no inhibition. But how strange! how curious! there is a complete inhibition. All are struck with surprise; but the lecturer knows that this is an effect we sometimes get. The opposite vagus is cut. The heart is pinched; pulmonary pressure would have risen if the inhibition had not prevented it.

When the demonstration was over, the spectators crowded round the animal. Young medical students put their hands into the open thorax, touched the heart, squeezed the lungs, pinched the large blood-vessels, investigated the mode of inserting cannulæ, and received instructions about the details of the experiment. A well-known physiologist, whose field of research is somewhat different, was present, and complimented the lecturer on his successful, interesting, and important experiment. "Well, you know," said the lecturer, "this experiment is not supposed to be useful."

When we left, after an hour and a quarter, the dog was still alive, and nothing indicated that the experiment on him was terminated.

The Dog that Escaped

"In this motionless body, behind that glazing eye, and with all the appearance of death, sensitiveness and intelligence persist in their entirety. The corpse before us hears and distinguishes all that is done around it. It suffers when pinched or irritated; in a word it has still consciousness and volition, but it has lost the instruments which serve to manifest them."

CLAUDE BERNARD

(On the effect of curare).

"Revue des Deux Mondes," Vol. 53, 1864.

"The Almighty who gave the dog to be the companion of our pleasure and our toils, hath invested him with a nature noble and incapable of deceit. He forgets neither friend nor foe, remembers with accuracy both benefit and injury. He hath a share of man's intelligence but no share of man's falsehood. You may bribe an assassin to slay a man, or a witness to take away his life by a false accusation, but you cannot make a dog tear his benefactor.

SIR WALTER SCOTT.

THE DOG THAT ESCAPED

People are strangely afraid of death. Some think that this life is everything and adore the dust, others are sure that this life is but a passing shadow, and that the light, the truth, the reality, await behind the portals of death. But still these different souls often meet in the mutual fear of the great change which is so well known and yet so unknown. . . .

What will not people give to prolong their life, to add to the pleasures and comfort of this existence? More than once things of moral significance and of spiritual origin are laid in the scales and found to be too light compared with the importance of prolonging human life. The enormous sacrifice of animal life to maintain the human, the terrible sum of suffering inflicted on the lower creation for the sake of our disease-

ridden bodies and dull understanding, what are they but instances of the love of the present and the fear of the future?

Fear of death everywhere: in the king's palace and in the beggar's hut, in the shambles and in the woods.

But there are some who always hail the touch of death as a blessing—the tortured victims waiting weary hours in the laboratories from which love and light have fled.

The tormented long for their freedom, but the tormentors fight the merciful death. They are artists in the black art of producing the utmost agony, while the gateways through which death could enter are carefully watched; but sometimes they are not clever enough. . . .

There is a dark-coloured dog, somewhat resembling the Dalmatian or the bull terrier in shape, on the operation-board. The neck is opened widely in two places, and there are loads to keep the wounds open. He struggles as much as he can till the lecturer injects something into the jugular vein; a peculiar stillness follows.

"The animal is now slightly curarised," says the demonstrator; "we want to excite the sympathetic and the vagus end." Another professor is also present and helps to arrange the apparatus; he then sits down among the audience. But the lecturer finds the dog suspicious. He looks at it carefully, and then begins to squeeze the chest of the animal methodically with both hands. Arrangements for artificial respiration have not been made. Was the dose of curare too strong? Many times when sitting near the miserable animals writhing under the scalpels and electrical currents have we wished and prayed that they should die, but never have we so intensely hoped for the deliverer as now.

The electrical changes in the submaxillary gland are to be studied experimentally. For, as the lecturer himself remarks, "there is very little to be said about electrical changes, for we know very little about them." When there is little to say about a subject there is always plenty of time for experiments on animals.

The lights are lowered and the galvanometric record is to be studied on a screen. Nerves are stimulated; there is a very small visible effect. Longer and better stimulation; there is a still smaller effect. Stronger stimulation: there is no effect. The lights are turned up, and the lecturer anxiously begins to squeeze the dog's chest again. He rings the bell and asks the attendant for another tube. Something may again be wrong with the apparatus. . . .

The room is again made dark and the stimulation starts. There is no effect—no effect whatever. . . . And when the electric lamps now distribute their white bundles of light over the scene, the spectators and the demonstrators look so unusually quiet. Is there anything out of the common? Experiments often fail; they do not make people serious. Where are the applause and the laughter and the gay conversation?

"The reason why we did not get any effect by exciting the sympathetic is that, probably by stopping the respiration, the

submaxillary gland was injured by the prolonged asphyxia," explains the lecturer.

Yes; the asphyxia was prolonged; it will last a long time; for death has succeeded in following the dose of curare into the blood and has released the animal.

There is no more animal now to experiment upon, so the demonstrator must be content with speaking only.

When the lecture is over some young medical students rush up to the dog and begin to squeeze its chest repeatedly, just as they had seen the demonstrator do. We stop to look at the animal before we leave. The right side of the head is quite flayed; the blood has clotted on the board under his mangled neck. We feel wonderfully calm and happy, but our eyes are wet, and there is something like a prayer in our hearts for the welfare of the little prisoner that has escaped. . . .

The students had left, the professors too, and there was only the attendant standing by the animal. We asked him some questions as to the disposal of the dead

bodies, and he told us that they are burnt. We also asked if rabbits are used, and he informed us that no rabbits are experimented upon in this place. We suppose dogs and cats are the only suitable animals for that laboratory.

At last we said, "This dog is dead, is it not?"

"Oh yes," he said, "he is quite dead."

And never before have we felt such a profound satisfaction on hearing that somebody "is quite dead."

A Dog Injected with a Substance Derived from a Lunatic

"I believe I am not interested to know whether vivisection produces results that are profitable to the human race or doesn't.

"To know that the results are profitable to the race would not remove my hostility to it. The pains which it inflicts upon unconsenting animals is the basis of my enmity toward it, and it is to me sufficient justification of the enmity without looking further.

"It is so distinctly a matter of feeling with me, and is so strong and so deeply rooted in my make and constitution, that I am sure I could not even see a vivisector vivisected with anything more than a sort of qualified satisfaction.

"I do not say I should not go and look on: I only mean that I should almost surely fail to get out of it the degree of contentment which it ought, of course, to be expected to furnish."

MARK TWAIN.

From a letter addressed to the Secretary of the London Anti-Vivisection Society.

A DOG INJECTED WITH A SUBSTANCE DERIVED FROM A LUNATIC

"ALL KNOWLEDGE IS USEFUL."

Choline is a name given to a substance which has been found to accompany the degeneration of nervous tissue. It is detected in the blood and cerebro-spinal system in certain nervous diseases, especially in general paralysis of the insane.

We are now going to see the effect of an injection of choline, prepared from the cerebro-spinal fluid of an insane person, on the blood-pressure of a dog.

There is a small grey-black wavy-haired dog on the operation-table. His hair is like silk, clean and trimmed, and he looks as if he had been petted and spoilt all his life. He reminds us of another dog that we have seen somewhere long ago.

The demonstration begins. The lecturer tells us that the animal is anæthetised with morphia and some chloroform, and adds: "These unusual circumstances under which the experiment is performed will perhaps interfere with the results." Was it the morphia and chloroform which constituted "the unusual circumstances"?

The abdomen has been opened, and a loop of the intestine is enclosed in an intestinal oncometer, by which the volume-changes in the intestine will be measured by a recording tambour; expansion of the intestine will press air into the tambour, the lever of which will rise. The blood-pressure is also recorded. The peripheral end of the cut vagus is stimulated; there is a fall of blood-pressure and a fall of the intestinal lever. Five cubic centimetres of a solution of sodium chloride is injected, and the result is a fall in blood-pressure, whilst there is an increase in the volume of the intestine. There is a delay before the expected effect appears, and the lecturer again suggests that the delay may be due to the "unusual

circumstances." A small dose of atropine is now injected subcutaneously; there is no effect. Another dose of atropine is then injected into the external jugular vein.

These experiments have all been preliminary studies, before the real demonstration which will teach us the effect of choline takes place. There are so many questions that press themselves on the modern enquirer into physiological problems, so many suggestions as to how the living body of a dog, a cat, or a rabbit will receive this or that poison, how it will behave when stimulated if these or those nerves are cut, not to mention matters of such profound interest as to how one section alters the effect of another section, or how the effects of the first injection may be entirely counteracted by those of the next, etc., that it is quite natural that the teachers of physiology, who are themselves led by these ever-arising questions, should be anxious to awaken in the minds of the students a similar thirst for experimental enquiry. This dog, therefore, like so many other dogs in the laboratories,

must go through a series of experiments.[1] What could a poor dog do better than give his skin, his blood, his intestine, his sensitive nerves, which flash the messages through his body and bring about the interesting "effects" of our experiments, to the service of our inquisitiveness, and let us have an hour's entertaining play with Life?

Choline is now injected; the result is a *very marked* rise in blood-pressure.

The lecturer declares that the dog will now be killed. How exceptionally kind and considerate! It is to be killed by blowing a little air into the jugular vein. The assisting demonstrator attaches a glass tube to the cannula in the jugular vein and blows some air down the tube, but the levers are still in motion, showing that the flame of life is not blown out. He repeats it and then sits down among the audience. The dog has been killed strictly scientifically.

[1] There is no waste of material. In "A Manual of Physiology," by G. N. Stewart, M.A., D.Sc., M.D., students are advised (on page 460) in their researches on Thyroidectomy

The professor continues his lecture. He refers to the general accusation against physiologists that they are too unpractical, working too much in the clouds, and not thinking of the immediate usefulness of their work, and he repudiates these worthless reproaches with the words : " But of course all knowledge is useful."

The little dog, however, is not dead. It has begun to struggle and seems to be in great pain. Nobody seems to notice it; besides, it is really shameful of a dog that has been killed by an eminent scientist to revive. At last the lecturer happens to look at the dead dog. He says something to the assisting demonstrator, who leisurely rises from his seat and strolls up to the animal. In order to stop any further pranks played by this obstinate life, he resorts to his scalpel.

When the lecture is over we go up to look at the animal and the apparatus closely.

to : "Study the anatomy of the neck and the relations and blood-supply of the thyroid glands in a dog used for some previous experiment."

As we stand beside the body of the dead dog, a scene from the past rises in our memory. It was in an old cemetery in France on a bright, sunny autumn day. The sun had just risen and the early morning dew lingered still on the rose-tinted leaves, that had fallen in heaps over the graves. There was nothing in the place to attract particular attention, the simple green mounds covered the earthly remains of many a lowly life. We were just leaving the churchyard when a grave that seemed to be rather new aroused our interest. In the soil there were everywhere traces of small paws that had been scratching up the earth, and the grave looked altogether uncared for. In the middle of the mound there was a deep hole, and when we bent over to it to see what could be the cause of this, we saw the little body of a small grey-black dog that was dead. His wavy coat had such a peculiar silky appearance, in spite of the lumps of damp clay that stuck to it. The little loving dog had gone to find his human friend.

The two dogs are much alike, but their deaths are very different.

The one gave his life out of love for man. The other was mutilated to death because of man's want of love.

Is *all* knowledge useful?

More Experiments

"These scientific pursuits were now defiantly, provokingly, insultingly separated from the science of religion; they were all carried on in defiance of what had hitherto been held to be compassion and pity, and of the great link which bound together the whole creation from its Maker to the lowest creature."

RUSKIN.

Speech at Oxford, December 9th, 1884.

MORE EXPERIMENTS

It is said of the apostle of physiological experiment, Magendie, that he substituted experiment for thinking. This is not only true of the apostle; his converts, wherever they are to be found, exalt experiment above everything else. Common sense, sound reasoning, and judgment are cast to the winds, and their place is taken by a morbid taste for every new form of experimental research. It is much more inconvenient to give careful thought and meditation to difficult problems presented by the living organism, than "to thrust in the knife to see what will come of it."

Our modern physiologists are like children tearing their toys to pieces to see how they are made, and they are loth to listen to anybody who tells them that things are not

what they seem, and that Nature does not yield her deepest secrets to those who *a priori* state that everything which exists can sooner or later be touched, seen, heard, smelt, or tasted, and measured or weighed.

The faith in experiments on living animals has grown so strong, and the longing for them so uncontrollable, that we have, not once nor twice, but many times, observed how successful experimenters, when compelled to lecture without vivisectional demonstrations to a class of students, look nervous, dissatisfied, and bored, and how the same men exhibit the most active interest, vivacity, and good spirits when, another time, with scalpel in hand, they stand before an animal stretched for the operation. To many this liking for class demonstrations, although they all agree that such demonstrations generally go wrong, may seem strange ; but from what we have seen of the true vivisector, who does go to his work with joy, we do not wonder at it. They do not feel at home with mere talking ; they want concrete facts, and these to them are only to be

found in experiments. They might explain a theory in a few words to the students; they might make them ten times more conversant with the whole scope of physiology; but they prefer to introduce them to complicated and far-fetched experiments on debated questions, and to rouse their curiosity in these. They also seem much to prefer experiments on living animals than on dead ones or on isolated parts. Once we saw a physiologist who had made arrangements for several demonstrations during his lecture, all of which, except one of much less importance, were not of a nature to require any living animal. He had already begun one when he changed his mind and said, "No; I think I will do the frog first." And he did do the frog first, and a good deal of the time was spent over this, and in chasing the frog that tried to escape. The dry scientific lecture was at once transformed into a more entertaining one.

The physiological theatre offers plays that are as exciting, thrilling, and entertaining as any others; there is quite enough of murder

ous attempts and of struggle for life, and the manager is anxious to bring the best performers on the stage. Not a few are rivals, and try to overthrow each other, but that does not make the drama less exciting.

"Experiments, more experiments," has become the password, without which no one is admitted to the arena of competing physiologists.

It has gone so far that even Nature has to share the experimental glory. During one lecture at which we were present the professor made the following pleasant remark · "The experiments which are made for us by Nature, and which we term diseases, are not so exact as we physiologists should like." This might have been only a form of undeliberated jest, but we find a somewhat similar expression elsewhere.

And by this time we ought to know that vivisectors are not contented with any "experiments made by Nature."

A Troublesome Dog

"Why does the suffering of a dog so upset me? . . . . Why are all the animals of creation my relations? Why does the very thought of them fill me with pity, tolerance and tenderness?

EMILE ZOLA.

From "Dog Stories" by Zola and others (Office of the "Animals' Guardian").

A TROUBLESOME DOG

These lectures on the circulation have taught us much about the technique of vivisection but very little about the circulation. For to-day's demonstration a strongly-built, rather large, brown mongrel dog has been chosen. The abdomen has been opened, the muscles cut through, vessels cut and ligatured, the peritoneum opened, the intestines pulled over to the right side, the kidney exposed, isolated, and then placed in an oncometer; the neck has been cut open, the external jugular vein isolated and a cannula tied in, the carotid artery has also been exposed, and a cannula, connected to a mercury manometer, inserted.

The vagus is stimulated: there is a fall of blood-pressure, and the writing point denoting the changes in the kidney volume shows

the diminution. The vagus stimulation is made stronger and longer, and there is a bigger fall in blood-pressure and more marked diminution of the kidney.

The animal's head is covered with a cloth, and there are layers of cotton wool over the exposed viscera to prevent them from cooling. There is a faint whining sound which we first think comes from some other dog operated upon in another room. But the whining grows louder and more piteous, and the animal struggles so that the cotton wool moves to and fro. The assistant demonstrator pours a few drops of something on a cloth over the head, and the lecturer tells us that the animal has had morphia and a little chloroform. We do not doubt that it must have been very little of both. The animal is quiet for a minute or two. Supra-renal extract is injected into the jugular vein ; the writing points of the levers now run into one another and cause disorder in the tracings. The dog begins to whine and struggle again whilst the demonstrators are

engaged in rearranging the levers. Their ears, however, are not trained to listen to that kind of sound, and five minutes elapse before they notice anything. A few drops of the contents in the bottle of something are again applied to the cloth.

The first rise in blood-pressure and increased kidney volume after the injection of the supra-renal extract are studied, then the constriction produced by the kidney vessels. The vagi are now cut to let us see the effect on the volume of the kidney, but the lever which shall demonstrate this does not make any movement. Something has gone wrong. The volume pulse has disappeared. "This does not teach us much about the great flow of blood through the kidney," says the lecturer, and adds, "We cannot tell whether there is an increased or decreased flow of blood through it."

It is very important for the success of these experiments that the oncometers be perfectly air-tight. There is a leak now,

and the oncometer has to be reopened and the packing of the strips of wool and vaseline mixture round the kidney must be done again. It takes some time, and the cries and struggles of the dog grow louder and more forcible. The lecturer looks a little nervous now when, even with good will, it is impossible not to hear and see. The trusted bottle of something is again called to the rescue; the situation is rather awkward.

The renal vein is compressed by means of a piece of wire and a rubber ball: there is a slow rise in blood-pressure. The clamping is repeated longer, and now there is a fairly considerable rise in the volume of the kidney.

It would be a great pity to miss another dose of supra-renal: comparison is the essence of the wisdom of life. We have now tried clamping without supra-renal. *What would be the result of clamping after supra-renal?* A dose is injected. Whilst the constriction is still present, the golden opportunity is grasped, and the vein clamped.

Be prepared to listen: *the rate of rise is this time quite slow.*

A solution of sodium sulphate is injected, some amusing things are said, and most of the spectators laugh. The injection produces a slight rise in blood-pressure and a gradual and very slow dilatation of the kidney vessels. The dog groans as loudly as he can with his tied muzzle. He must have managed to loosen the strings, for now the low whine has grown into a suppressed and long-drawn howling; sometimes it is like the stifled sobbing of a little child; once or twice there is a distinct bark. The lecturer looks vexed, and the bottle of something is again exhibited.

What are the watery and smell-less contents of this bottle? We are quite sure that the lecturer is no great friend of deep anæsthesia, for in the book which he recommends for the use of students, the readers are several times warned against this. Where the stimulation of the superior laryngeal is taught, we read: "In this instance, and indeed for all these nerve

stimulations, the rabbit must not be too deeply under the anæsthetic." Again, in treating of the stimulation of the central end of the vagus, we noted the following sentence: "This result is much better obtained if the anæsthesia is not too deep." From another part, treating of the stimulation of the sciatic nerve, we quote: "Often, too, struggling movements are produced, especially if the animal be only lightly under the anæsthetic, when with each convulsion the blood-pressure rises considerably. The only completely satisfactory method of obtaining a pure pressor effect is to previously curarise the animal."

The lecturer is now, of course, only using light anæsthesia, and he has not to-day cared for the "only completely satisfactory method."

After another injection of sodium sulphate and some more clamping of the renal vein, a cannula is tied into the ureter to show the effect of the diuretic. The lecturer finishes by saying he is afraid that the volume-

changes which have appeared are not at all reliable, and that the experiment has not been altogether a success. "The apparatus for kidney work is not so good in this place, for we work on other organs here; but of course it is the method that it is important to learn."

Yes; it is the method, the atrocious method of the vivisectors, that it is important to learn.

After the lecture we examined the dog closely, and were shown the details of the kidney and clamping apparatus. As we bent down over the quivering frame of the tortured animal, it *growled* repeatedly. Who can stand by the side of a helpless creature thus tormented without being filled with a burning indignation against the perpetrators of such deeds? Only he who cares no longer for the things that make life worth living—only he who has lost the sense of shame at cowardice, which is the never-failing sign of every soul that has attained to true culture.

We had the satisfaction of speaking to a

medical student who expressed disgust at such demonstrations.

When we left, after an hour and a quarter, the dog was still growling and whining on the operation-table.

Pain

". . . . This dog, so very superior to man in his affection, is seized by some barbarian virtuosos, who nail him to a table, and dissect him while living, the better to show you the mezeraic veins. All the same organs of sensations which are in yourselves you perceive in him. Now you automatonists (*machinistes*) what say you? Answer me. Has Nature created all the springs of feeling in this animal, that it may not feel? Has he nerves to be without pleasure or pain? For shame! Charge not Nature with such weakness or inconsistency."

VOLTAIRE.

"Dictionnaire Philosophique,"
English translation, pages 29 & 30.

PAIN

Through the noise of the machines, the buzz of the electrical batteries that stimulate, the whistle of the air pumped into cut throats, through the talking and laughing of men bent over their victims, there comes the cry of pain.

Behind the light clouds of smoke from cigarettes, consumed in ease and comfort, from among a mass of delicate machinery, of metal and glass and caoutchouc, of skin slit up and quivering entrails drawn out from the writhing mass of flesh and bone and nerve, there are eyes that gaze out in anguish, eyes from which the hope of death has fled.

Nobody hears the cries, nobody heeds the looks.

"Pain?—there is no pain in our labora-

tories," they would answer if you asked them, and add: "*We* have never seen an animal in pain."

No, it is true, they do not hear and they do not see, for their ears have been stopped and their eyes blinded by the Deity of Selfishness, whose servants they are. Pity has fled from their temples long ago, and if she tried to enter again she could not breathe the stifling air. They have left off sentiment long ago; they do not think of the possibility that animals, nay, *animal machines*, ever feel pain. And when an animal screams or struggles too much, a faint suggestion that others might mind—because others are ignorant—may enter their brains; but "we have never seen an animal in pain"—and we are not going to see it either.

Do you think this moaning dog, with his spleen in a glass box, feels anything? You do; well, that is just an instance of how laymen misunderstand everything. My dear sir, you know nothing about reflexes, so, please, don't come and teach us anything.

Many are quite honest, as honest as the

deaf and blind man who swore that no thief had passed the place where he stood.

There are some who are half-conscious of the fact that pain inflicted on animals is pain; they talk much about anæsthetics and use a little. They have read what a lot of people, who are not altogether insane, say about the cruelty of vivisection, and they are above all anxious to show how humane they are.

There are others, but only very few, who admit that pain is inflicted, and who openly declare that they have the right to give any amount of pain to the lower animals, if thus they can gain knowledge or prolong the lives of men.

But on the whole vivisectors appear perfectly unconscious of their infliction of pain, and this is the chief form of complete unconsciousness that at present is manifested within the physiological laboratories.

The chemist and the physicist do not take the tastes of their material into consideration, and the physiologist, who feels more and more sure that life is nothing but the result of an aggregate of chemical and

physical laws, does not enquire into the feelings of the centre of such laws on which he is working, whether it be a frog, a rabbit, a cat, or a dog. All animals are research beasts.

Once we saw a physiologist engaged in a long and painful experiment on a dog. A few days before a little child had been born to him. He belongs to that class of experimenters who appear to be in a state of perpetual moral anæsthesia in their feelings of the relationship to the animal world.

As we watched the work of his merciless hands we thought of the newborn babe that lay waiting for the father's tenderness. When his day's labour was ended, he would no doubt go home and rejoice over that little child, and his heart would respond to the cries from that tiny throat and his eyes would not be blind to the signs of pain in that delicate body.

He would scorn a parallel drawn between the helpless dog and the helpless babe, and he would be at a loss to find words strong enough to express his disgust if a very

advanced colleague advised him to test the same experiment on his own child.

Times have changed, and the sympathy for the sufferings of "the little ones" in this world of struggle and pain has in some souls been extended to include also the animals. They cannot think as we do or speak as we do, but they can feel and suffer and be faithful unto death.

The vivisector has not yet had time to study these new ideas.

But there is a very old word which he has listened to many times—at least, when he too was a little child—and that is:

Blessed are the merciful, for they shall obtain mercy.

The Struggling Cat

" . . . . . the total abolition of the horror we fight against must be our real aim. In order to attain this our opponents, the vivisectors, must be frightened, thoroughly frightened, into seeing the people rise up against them with sticks and cudgels. Difficulties and costs must not discourage us. . . . . ."

RICHARD WAGNER.

Bayreuth, October 19th, 1879.

Translated from a letter on vivisection to Ernst von Weber.

Published 1883 in Dresden.

THE STRUGGLING CAT

In a former lecture on the production of heat in glands the lecturer said that he was sorry he could not make a certain experiment of Heidenhain's, which he thought was a very uncertain one but still worth repeating. "We are rather short of dogs now in the laboratory, so I could not have one for this afternoon," he said. The laboratory resounded with howling and barking of dogs when the lecturer said this, but all those dogs were perhaps destined for the knives of other scientists, and the accidental waste of laboratory material, of which he was the involuntary cause at his last lecture, may have left him without material for this one.

Once he had to manage without an animal,

but to-day he need not feel uncomfortable for he has got a cat.

When we enter, ten minutes before the lecture is going to begin, there is a tabby cat with neck cut open struggling violently on an operation-board put in a corner of the room. Some students are already there, and among them there are a few exceptionally thoughtful. One looks quite upset when seeing the animal, and turns to the others, saying, "I am sure they have forgotten to give the cat an anæsthetic. Do tell the lecturer." A young man walks out of the room to let him know that they have forgotten to anæsthetise the cat. The lecturer enters, smoking his pipe, looks at the cat, tightens the strings that hold the legs—and walks out again. The humane student, a girl with a delicate and refined face, looks sad and anxious. She tries not to look at the animal, opens a book and pretends to read. She does not like to be called sentimental, and she supposes that it is necessary for science to do these things, but still she cannot help crying when

she looks up and sees poor pussy in this state. "Oh, it cannot be suffering much," she says with tears in her eyes; "they cannot have done anything to it yet, can they?"

She then puts her fingers into her ears and tries only to think of the contents of the book. Another lady, who works to obtain honours in physiology, enters the lecture-room. She comes from the laboratories and sits down by the side of the sensitive girl, who at once asks her something which is answered by a laugh. The aspirant to physiological honours must think the other very foolish.

The cat struggles on his rack as before. There is a small group of women students who have just entered, and who discuss the cruelty in an experiment like this where it is clear to everybody that the animal is not under anæsthesia. Two of them express indignation at what they see, the others make light of it.

The lecturer begins by telling his audience that he has been working with this cat earlier in the afternoon. (The humane

girl in front of us starts.) He has been repeating Heidenhain's experiment with exciting the sympathetic in order to study the increase in the production of heat in the submaxillary gland, but he has not been able to produce the desired effect. He wishes now to repeat it again to us, to let us also see that there is no effect. He then starts the stimulation and nobody notices any effect, except the cat, who in vain tries to be spared.

When the non-effect is satisfactorily demonstrated, the lecturer rings the bell and tells the servant who enters to take away the cat.

For how many hours had that cat been stretched on the operation-board, with open wounds and electrodes on quivering nerves, and for how long a time still would it be left in that position?

It is worth noting, that during several demonstrations nothing has been said to the students, indicating how or what anæsthetics have been used. The students have been left in perfect ignorance of the various means

employed, or not employed. The faults to be found from a scientific point of view against such a system of teaching physiology are only too apparent, but these are of small importance compared with the grave *moral* dangers of such a negligence. Students are taught how to manipulate and stimulate the internal organs of the living animal, and their teachers show a most irreproachable desire to teach their pupils the operative technique of vivisection, whilst they evince very small interest in teaching the details and principles of anæsthetising.

Long Experiments

"No physical gain can possibly equal the injury caused by the moral degradation of the feelings which such barbarous experiments must naturally induce."

The late Earl of Shaftesbury.
Speech in the House of Lords, May 22nd, 1876.

LONG EXPERIMENTS

OR

THE FATIGUE THAT CANNOT BE DEMONSTRATED

THERE has been a great controversy round the question whether nerve can exhibit signs of fatigue or not. No one has yet succeeded in showing fatigue in medullated nerve-fibre.

The view has been put forward that the sheath is the only agent capable of repair, and that it protects these nerves from fatigue.

In a series of experiments done by Prof. Halliburton and Dr. Brodie[1] with non-medullated nerve, they came to the

[1] "The Croonian Lectures on the Chemical Side of Nervous Activity," by W. D. Halliburton, M.D., F.R.S.

conclusion that fatigue cannot be demonstrated in these nerves either. They hold that the medullary sheath may play some part in nervous repair, but do not, therefore, consider it of fundamental importance.

In the particular experiments on which these scientists base their theory, nerves of living animals were stimulated for three, four, six, and ten hours. And yet the experimenters could not discover signs of fatigue. Whether the "fatigue" was equally imperceptible to the victims of their studies is another matter.

The lecturer tells us that he will perform a similar experiment before us to-day. We are also called upon to use our eyes and see that there is no fatigue.

A white fox terrier, which, according to the lecturer, has been anæsthetised with "morphia and a little chloroform," has been secured to the operation-table standing by the blood-pressure apparatus. The abdomen has been cut open, the spleen drawn out, and enclosed in an oncometer; the splenic nerves have been laid bare. The neck has

also been opened; there are two levers registering upon a moving cylinder, the one denoting the changes in the volume of the spleen, the other the arterial blood-pressure.

The lecturer informs us that the stimulation, by means of strong induction shocks, of the splenic nerve chosen, began a quarter of an hour before the lecture—to give us more time to study the effect of long stimulation, and that the electrical apparatus, through which the splenic nerves are now excited, is in another room, for "the noise would be disagreeable." This is no doubt true; the noise would fatigue our nerves.

There is a metal tube under the nerve through which cold and warm water can be kept flowing to enable us to note the changes produced.

"This is a very rapid and convenient method," says the lecturer; "it is one of our principal experiments, but usually much longer time is required."

The lecturer criticises the methods and results of Dr. Waller and Miss Sowton. The latter, who worked upon the olfactory

nerve of the pike, maintained that changes due to fatigue could be demonstrated.

The lecturer remarks that, though these experiments, of which we now see one, take a long time, this is nothing compared with the experiments on regeneration of nerve in which he and another physiologist are now engaged, six months often being the time for these. They are done on monkeys, and consist in cutting anterior or posterior roots, in cutting motor nerves, suturing them up, allowing them to heal, stimulation with faradic currents, etc. He complains that monkeys are most troublesome, and that they die at all times that are inconvenient to the investigators.

This is only another instance of the unreasonable attitude which wicked animals keep up against these men who in their benevolence allow such inferior creatures to serve them.

The lecturer makes a heartrending appeal for sympathy when he describes how experimenters succeed in keeping monkeys alive during the winter months, and how

these mischievous animals may die just when spring arrives and you expect them to live. Thus six months' work may get lost.

It is very interesting to study the different notions of convenience which vivisectors hold with regard to themselves and with regard to the animals experimented upon. We learn that the experiment "may be conveniently concluded by killing the animal by asphyxia"; that Mr. So-and-So's method of vivisection is extremely convenient and worthy of reproduction; that these operation-boards or instruments are convenient; and we have to-day seen an example of thoughtful consideration for the inconvenience which might be caused by the noise of electrical stimulation.

But the vivisector's ideas of convenience or inconvenience in animals are quite free from any confusion with those which he applies to himself or his friends.

Let us take an example among many. On page 73 in his "Croonian Lectures" Prof. Halliburton describes his experiments on twenty cats. "In the majority of cases both

sciatic nerves were divided in the upper part of the thigh. During the operation the animal was anæsthetised with A.C.E. mixture and antiseptic precautions rigorously adopted. . . . The animals suffered but little inconvenience ; they were able to walk about, in spite of the partial paralysis of the hind-limbs ; they walked on the heels of these limbs, and in consequence the fur was worn off here in those animals which were kept alive for sufficiently long periods."

The cats were killed 6, 8, 10, 13, 25, 27, 29, 44, 60, 100, 106 days after the operations.

Now it would be interesting to know in what degree of inconvenience the writer of these lines would measure his own state if he were unfortunate enough to have "to walk about on his heels with partial paralysis of the hind-limbs" for three months ?

But let us return to the fatigue that cannot be demonstrated. We are quite sure that if one vivisector repeated this rapid and convenient method for giving long, long stimulation to some exposed non-

medullated or medullated nerves in a brother vivisector, the fatigue would only too easily be demonstrated, although it could not be spelt out by the lever or caught up with the forceps, or even accurately described by the galvanometer.

The lecturer has placed his papers, containing the material of his lecture, on the dog. It is a convenient table.

When the lecture is over at a quarter-past six—an hour and a half after the stimulation began—it is declared that there are no signs of fatigue in the nerves, though the blood-pressure has fallen.

We examine the animal and the apparatus closely, the spleen in its box and the electrodes on the nerves. The lecturer shows us a larger oncometer, meant for the spleens of larger animals.

It is ascertained that the electrodes are placed on the nerves all right, and we then watch the changes in the spleen inside the glass box. The spleen is allowed to recover from the last shock, when another is applied; we see one part of the spleen

slowly contract and shrink from the glass lid.

We ask why the whole spleen does not contract, and we are told by one of the demonstrators that "we could not, of course, bring all the nerves of the spleen into action; one never can: it is only those of one side."

The stimulation had now been going on for an hour and three-quarters. Once during this time the assisting demonstrator had poured some drops of an anæsthetic on a cloth over the dog's muzzle. The animal was quiet.

How long would this stimulation go on? Ten hours is a nice time for it. The method is comfortable and convenient; the longer the stimulation the better. Prof. Halliburton, in the above-mentioned work, refers to some experiments of this kind by Eve that went on for twelve hours. We do not think the apparatus now at work requires much attention; the stimulation of the splenic nerves of this fox terrier may perhaps go on till to-morrow morning, to

test the theory that "nerve can never exhibit signs of fatigue."

There are four physiologists standing round the apparatus and operation-table when we leave. They have lit their cigarettes; they talk and laugh, and feel no fatigue.

The Only Completely Satisfactory Method

'I could think he was one of those who would break their jests on the dead,
And mangle the living dog, that had loved him and fawn'd at his knee,
Drench'd with the hellish oorali—that ever such things should be!"

TENNYSON.

In the Children's Hospital.

THE ONLY COMPLETELY SATISFACTORY METHOD

This time the lecturer has made up his mind not to have any disturbances like those caused by the troublesome dog during a former lecture, and he has doubtlessly found the remedy to be curare. For the big white bull terrier that is fastened on its back to the operation-table, mangled and mutilated in a way that according to the laws of Nature would be incompatible with any life left, does not make a sound or a movement. The chest has been transformed into a deep and broad red hole, skin, muscles, ribs removed, the lungs and the heart exposed, the neck opened, a tube tied into the trachea, and artificial respiration is being kept up.

The subject of the lecture and demonstra-

tion is the total blood-pressure variations and there are not less than four records taken of the differences in pressure in the carotid artery, pulmonary artery, and in the left and the right side of the heart.

An hour is spent in the study of these variations and the tracings obtained are supposed to be extremely correct, exact, and typical. Instead of the mercury manometer Hürthle's rubber manometer is used. There is a great inertia in the moving parts of the mercury manometer, because the pressure variations can only be recorded some time after they have taken place, and it cannot record the highest and the lowest pressures when changes occur quickly.

The rubber manometer is supposed to possess "the least possible inertia," but in time it will surely be found out that this one also possesses a good deal of inertia. Supposing all the minute alterations and delicate changes in the flow of blood in the living animal could be correctly described by the levers scratching lines on the sooty paper, we still could never, by methods like

the one used now, learn to know the *normal* flow of blood.

This half-flayed, paralysed dog, with hundreds of small blood-vessels cut and bleeding, with pieces of glass forced into opened veins and arteries, with the heart and lungs unprotected from the influence of the air and light in the room, is he now in a normal state, and can we trust even a rubber manometer with the least possible inertia to tell us how his blood circulated, when, some time before, he was a happy and healthy dog, running by his master's side, and wagging his tail in response to the kind words from his human friend?

The inconsistency in experimental physiology must strike every thinking person. In normal respiration there is a rise in blood-pressure during inspiration and a fall during expiration. Every budding vivisector knows that *artificial respiration entirely reverses this*, and that the inflation of the lungs produces a fall of pressure, whilst there is a rise in expiration. In artificial respiration blood-pressure is thus entirely *abnormal*.

and nothing of any value whatever for the knowledge of the normal flow of blood can be gained by this method.

And yet "the records" of the blood-pressure in this animal are received as deeply scientific and important information. If the pump were stopped and no more air forced into his throat, his lungs would collapse, and the dog would die, for death is the only normal result of such a bodily state, and Nature is a great deal more merciful than Science. But physiologists care little for the laws of Nature, and are brimming over with pride in their knowledge of the blood-pressure. That this knowledge to a very great extent is based on experiments on creatures mutilated nearly to death, kept artificially alive with an entirely abnormal circulation, matters little to them.

In the physiological laboratories endowed by public generosity for research believed to benefit the impaired health of humanity, or to ennoble the minds of men by laying the rich fruits of true knowledge before the intellectually hungry, thousands of dogs

are treated like this one, and absurdities, that pass under the heading of physiology, are sent out into the world and received with bows and reverent gratitude by the great public, who think that some one wiser than they will find the philosopher's stone under the veils of scientific terminology, which they cannot penetrate.

There are some who have sought earnestly and patiently, and found nothing but words—only words ; but behind them they have seen the only reality hidden from public view—the immeasurable burden of pain and horror borne by the victims of this imaginary science.

Let us again direct our attention to the dog whose circulation is being studied. The string that forcibly pulled down the right hind-limb to a slit in the table, has got undone, and the leg regains its natural position, pushing away the cloths that covered the abdomen. There are no movements in the uplifted leg ; it is stiff and motionless, as if it were part of a dead body. There is blood everywhere, on the floor, on the table on the dog's paw, and on the hands of the

vivisector, who goes on lecturing without minding the red colour on his hands. After some minutes the assistant demonstrator sees the escaped leg, and leisurely takes hold of the end of the string tied round the paw, pulls it down, and fixes it again to the table.

There are only a few spectators to-day, and the private research can begin almost at once when the lecture is concluded. A connection by means of a long glass tube is established between the crural and carotid arteries and the differences in blood-pressure noted.

The director of the laboratories is anxious to make the most of the dog, that is so quiet and nice to experiment upon, and he therefore proposes to test the action of betain, neurine, choline, and muscarine. It is especially the action of betain that he finds interesting, as he is inclined to think it poisonous He declares that certainty in this respect is of great commercial importance, as it is closely connected with the production of beetroot sugar. The lecturer, however, does not at all share his

opinion, and answers that he does not think there will be any effect at all on the dog, and that he is quite sure that the animal will not die of it. Twenty minutes more are spent in betain studies, and it is proved that it has no effect. It is very strange, therefore, to hear the director a few days later state in a lecture that he still thinks betain poisonous. Why is not a valuable experiment on an animal trusted?

An hour and a half have now been spent in work on this dog. The demonstrators have not told us that the dog has been anæsthetised, we have not seen any anæsthetic used during this long period, nor has there been any smell of ether or chloroform in the room.

We conclude that the wonderfully quieting and completely satisfactory curare has immobilised this dog.

A Grand Demonstration

"It is not necessary for a man to be a specialist in order to have and express his opinion as to the right or wrong of vivisection. It is not necessary to be a scientist or a naturalist to detest cruelty and to love mercy. Above all the discoveries of the thinkers, above all the inventions of the ingenious, above all the victories of fields of intellectual conflict, rise human sympathy and a sense of justice. . ."

INGERSOLL.

From the Chronicle of St. George, U.S.A., May, 1891.

A GRAND DEMONSTRATION

THERE is a strong smell of ether meeting us as we walk up the stairs leading to the physiological department. Medical students, qualified doctors, young men who hope to reach the minarets of independent physiological science, grey-haired men, with faces moulded frigid by years of private research, hurry into the lecture-room. The room is crowded by an animated audience. The professor of the laboratory introduces the lecturer, who is greeted by enthusiastic applause.

There are not less than three animals prepared for experiments: an Irish terrier, a white rabbit, and a tabby cat. There is no stinginess when an eminent man of science is going to impart his knowledge to others.

Pancreatic secretion is the subject of the lecture, and the animals have been fastened and cut up accordingly.

The animals are all in a row on their backs, the dog in the middle, the cat to the right, and the rabbit to the left. One laboratory attendant is watching over the dog and the cat, another, a boy, is standing by the rabbit. Drops of ether are now and then poured on cloths laid over the heads of the animals. The dog and the rabbit are lying still ; the cat struggles. The neck and the abdomen have been opened in each animal.

The lecturer refers to the work on the pancreas done by Claude Bernard, Heidenhain, and Pawlow. In speaking about the latter, who always worked with permanent fistulæ, the professor makes the important remark : "He always insisted on the necessity of perfect physiological conditions, that is, no pain and no anæsthesia."

He also speaks about the researches of Popielski, who showed that even after section of the vagi and extirpation of the ganglia,

the introduction of acid into the duodenum produces flow of pancreatic juice. Wertheimer, in France, confirmed Popielski's theory.

Bayliss and Starling obtained just as good a flow of pancreatic juice when the solar plexus was extirpated. They, therefore, came to the conclusion that the secretion of pancreatic juice is not of nervous origin but of chemical.

The experiments about to be made are intended to show the correctness of this view, and the lecturer says that he is sure his audience will like better to see the actual experiments than only to listen to his account of them, although the success of demonstration experiments always is uncertain.

He begins with the dog, by injecting twenty cc. of hydrochloric acid into the duodenum. The flow of pancreatic juice is expected to be greatly increased, but the expected effect does not appear.

"For this experiment it is best to use a dog in a starved condition," says the lecturer; "this one, however, came in only

recently, and his pancreatic juice has been secreted in digestion."

From where did the dog come? Who brought him there without having the sense to starve him beforehand?

The reason, then, of the failure of this first experiment was that the dog had not been kept long enough within the precincts of the physiological laboratory. Some poor ignorant person had fed him—perhaps one who loved him, and perhaps one who had no idea of the fate the dog would meet with a few hours later. His master may have "lost" him early this morning, and perhaps in his ignorance of the needs of this scientific age, he now anxiously hopes for his return every minute.

But no advertisements and no rewards will bring this dog back, he is quite safe here.

The professor now cuts open the belly of the dog with a pair of scissors, ligatures vessels, and cuts out the duodenum. The blood streams down his hands and over the dog's body. He carries the

piece of intestine to the water-tap, turns the tap, and cleans the duodenum. He then cuts it open, lays it on the table, and carefully scrapes off the interior mucous membrane. This is then put in a mortar and ground with powdered glass. Some acid is added. The mixture is heated in a bowl over a flame and stirred for about five minutes, then filtered.

The lecturer is now going to inject four cc. of this liquid, but before doing this he arranges the disordered parts of the mutilated belly. When doing this he explains that the mixture contains a depressor substance, and that he expects struggling will occur after the injection, and that "the dog's intestine might fall out" if care is not taken to keep it in place. This remark is fully appreciated by the audience, who applaud and laugh.

After the injection there is a good flow of pancreatic juice.

The operation-table with the dog is now carried to the side of the room, and the turn has come for the rabbit.

During the time that has passed the boy who is attending the rabbit has several times poured ether on the cloth over the rabbit's head. But in spite of that, the animal once stretched up its fore-limbs, which were not fixed to the table, and began to struggle.

When the table with the operation-board is now lifted up, and the rabbit carried to the place in the middle where the dog had been, the little animal again stretches up its fore-paws with claws thrust out.

The duodenum extract is now also injected into the rabbit. Violent struggling movements are produced, the animal lifts up its head, which is not tied down, and rises from its prostrate condition. The lecturer and the boy then hold it down.

The result on the pancreatic secretion of this injection is very slow in manifesting itself, and after a few minutes' waiting the professor declares that "it is not worth while to wait for this any longer. Let us try the cat"!

The rabbit on its board is then carried into a corner of the room. The lecturer

tells us that we can look at it afterwards, and that the pancreas of a rabbit is very small, and that there is a continuous small flow of pancreatic juice in these animals, about one drop in every minute. After injection there ought to be two drops a minute. But he is almost sure that this experiment will be a failure.

The rabbit keeps moving its paws and will not leave off struggling. The professor of the laboratory tells the boy something and hands him the bottle of ether. The boy takes up the board with the rabbit, and walks out of the lecture-room with the rabbit in one hand and the bottle in another. When the animal cannot keep up a good appearance it had better go out of the room.

After a little while the boy returns with the bottle.

The cat is carried to the spot where the previous demonstrations have taken place. Ether has been administered to this animal once before the lecture began, and now another dose is given by one of the professors, after some words from the laboratory

attendant. The cat has been struggling all the while whilst the dog and the rabbit were used, but it is lying still just now, because of the last dose.

The same extract is injected into the cat. The lever in connection with the pancreatic secretion shows a good flow.

"Cats differ from other animals in the extreme ease with which you get stoppage from the heart. We shall probably get a fall in blood-pressure and inhibition of heart. I hope it will not be permanent," says the lecturer.

Some pancreatic juice is now collected from the dog, mixed with starch and heated. After fifteen minutes we get "a lump of sugar, almost entirely maltose."

The professor concludes his lecture, amid applause, by repeating that the mechanism of the secretion of pancreatic juice is a chemical one, and says that this is the first instance we have of a chemical co-ordination.

Between twelve and a quarter to two the dog has had drops of ether sprinkled over

the cloth over its head about five times. But at a quarter to two we see the dog, which hitherto has been quiet, suddenly turn the head, which is not fixed in a head-holder, the shoulders, and the upper part of the back over to the left side, as much as the tied paws permit. The animal then begins to struggle. The professor of the laboratory sees this, and hastens to sprinkle some more ether over the cloth.

The spirit of vivisection has seized the spectators. They rush down to the animals; there is loud discussion of the theory that has been demonstrated.

When going out we meet the boy carrying the miserable white rabbit into the lecture-room again. The little creature lies still on its board, the head is wet, the hairs stick to the skin, the eyes are protruding and look like glass balls.

The boy is polite and steps aside to let us pass. There is a murmur of many voices from the lecture-room—debated questions are filling the souls of knowledge-seekers with new life, and scientific interest runs

high. We have seen a demonstration of careful, complete, and public vivisectional anæsthesia as it is now practised. What about the careless. incomplete, and private?

Vivisection Bankrupt

"There can scarcely be imagined any experiments less capable of true scientific success than those of vivisection, though they have been the most frequent. We must not consider our rights (over animals), as absolutely unlimited."

AUGUSTE COMTE.

"Comte's Philosophy," chap. 40.

VIVISECTION BANKRUPT

"Perfect physiological conditions, that is, no pain and no anæsthesia" (*See page* 140).

No condemnation of the methods of present experimental physiology from the mouths of anti-vivisectionists could be more valuable to their cause than this description of perfect physiological conditions, given by one of the recognised leaders of the science. Pain and anæsthesia, indeed, make physiological conditions abnormal, and the conclusions drawn from experiments under such conditions erroneous, whenever they are used to build up a science of physiology instead of one of experimental animal pathology.

Scientific opponents of vivisection have always based part of their objections to its practice on this simple and indisputable

fact, and it is therefore a matter of no small importance to them to hear this admission from a vivisector.

When we enter the physiological laboratories, wherever they are and to whatever school they belong, what do we see?

In the stables and cages where various animals await their fate there is misery and half-conscious terror of the things of which they have a presentiment; when we follow them on their weary way up to the rooms where the operation-table, the knives and scissors, the electrical apparatus are ready for them, their mental anguish is soon augmented by bodily pain.

In the pain-tortured bodies, trembling under the sharp steel, bathing in their own blood, and in vain trying to tear the straps that fasten them to their crosses of agony, twitching under the piercing currents of artificial electricity, there is no trace left of the normal life in the nerves, in the blood, in the wonderful co-ordinated mechanism of the internal organs.

Or, when the nervous system, with its

myriads of delicate cells, the powers and innermost functions of which offer such unsolvable mysteries to our outer senses, is injured by curare, morphia, ether, or chloroform, how can we under such conditions get the faintest idea of their true nature?

Vivisection is bankrupt; all the teachings and bloodstained theories which are brought out from these laboratories under the name of physiology make one stupendous fraud. When the day of a true science has reached its zenith they will disappear like the evil smoke which obstructed the dawn of morning after the revelling nights of sacrificial worship of infernal powers.

When visiting the Pasteur Institute in Paris some years ago, the kinship of the modern science of tormenting to the worst forms of immorality in the "dark ages" became painfully clear to us. The light of the much-praised nineteenth-century civilisation seemed far away in this palace of artificial disease and well-paid quackery, among the thousands of dying and dead (for the dead animals lay among the living

in many cages) rabbits and guinea-pigs moaning under the burden of all kinds of human diseases.

After much scientific work and careful study we can reproduce our diseases in defenceless animals, but we cannot cleanse ourselves from them. Vivisection is bankrupt.

We saw the rabid dogs, whose brains had been poisoned and in whose eyes there was the look of despair. One little puppy stretched out a paw to us through the bars of the cage and looked up with a pair of appealing eyes.

We also saw the magnificent sepulchre of the "great Pasteur."

Mad dogs are dangerous, but this danger is nothing compared with that arising from the moral insanity of legally protected animal torturers.

Not until physiology and medicine cease to look for knowledge and healing in the bodies of injured animals can they penetrate into the region of the true and the healthy.

It happens sometimes that a vivisector

for a moment sees the bluntness of his knife.

Some time ago we heard a physiologist say: "We have only recently learnt the exact movements in the small intestine. If we expose the intestine of an animal the operation prevents good results. It is best studied with the Röntgen Rays."

But, on the whole, the present race of physiologists do not at all see the fallacy of working under imperfect physiological conditions.

Anæsthesia

"The conditions of the laboratory are different from those of the operating theatre, and human beings differ from the animals experimented upon." . .

From "Anæsthetics," A Practical Handbook, by J. Blumfield, M.D. (see Medical Monograph Series).

ANÆSTHESIA

The question of anæsthesia in vivisection experiments has been so much discussed by all parties lately that it may be well to put forward a few outlines of the lessons which can be drawn from a study of this the chief bulwark of defence for experiments on living animals.

In no branch of the vivisection controversy is the public more readily deceived than in this. Comparisons between surgical anæsthesia in man and vivisectional anæsthesia in animals are only too easily drawn and accepted without an adequate and necessary enquiry into the differences of physique, conditions, and object of operations.

The public is only too anxious to feel sure that "there is no cruelty in vivisection," and when some titled and illustrious vivisector endeavours to calm the disturbed waters of public opinion by saying "the animals are *of course* under anæsthesia," the conscience of a

great portion of the public is narcotised with facility.

Before accepting the vivisector's assurance that during this or that operation "the animal was unde A.C.E., morphia or ether," and was therefore insensible to pain, it may be well to consider certain well known experiences :

1. The difficulty of rendering animals, especially dogs, perfectly unconscious short of killing them. This is borne out by the opinions of many veterinary surgeons of great experience and practical knowledge, as for instance, Prof. Pritchard and Mr. Sutcliffe Hurndall. The effect of the various anæsthetics on animals is quite different from that on man. There is a great dissimilarity in the way in which different kinds of animals "take" anæsthetics. Moreover one dog may become anæsthetised by a dose which does not affect another dog of the same size. Mr. Sewell, the well-known canine surgeon, in giving evidence during the recent trial, confirmed this. He said : (Q. 1803) "All dogs do not take the same quantity. Two

dogs in the same state will not take the same quantity. What would kill one dog would retain consciousness in another dog."

2. The elaborate apparatus used in fixing animals for vivisection, the tying, muzzling and screwing down of the animals, proves that animal holders are far more relied upon by vivisectors than are the anæsthetics, and with very good reason.

3. Curare is used in a great many experiments and when this poison, which paralyses motor nerves, but leaves sensory nerves intact, is employed, the signs of recovery from anæsthesia, if anæsthetics have been used together with curare, cannot appear, and the vivisector may unwittingly work undisturbed on a conscious animal.

4. The objects of a great number of vivisectional experiments, especially physiological, would be frustrated by the induction of deep surgical anæsthesia. There are whole classes of experiments which are rendered useless when performed on an animal under deep anæsthesia. Among these, experiments on the salivary gland are

specially mentioned as being interfered with by the use of various anæsthetics and narcotics. "Opium," says Claude Bernard (*Leçons de Physiologie Opératoire*, p. 154) "which stops secretions, could not be used when studying the functions of the glands." (It is curious to note in connection with this, that according to the evidence given by vivisectors at the trial, and accepted by the Jury, the brown dog was first "nearly killed" by morphia and then used for an experiment on the salivary gland whilst life was restored by another overdose of A.C.E.)

"If the experiment on the salivary gland is only being carried out for demonstrational purposes one may poison the animal beforehand with chloral, chloroform or curare," says the only too honest Cyon (*Methodik der Physiologischen Experimente und Vivisectionen*, p. 264), and continues: "When on the contrary the experiment is carried out for the purposes of research, especially when dealing with the study of circulation in active glands, then it is better to avoid these poisons because of their influence on the circulation."

In the *Handbook for the Physiological Laboratory*, by Klein, Burdon-Sanderson, Foster and Lauder Brunton, p. 473, treating of the reflex excitation of the chorda tympani, we are directed: "Divide the lingual nerve close to its entrance into the mouth and excite its central end with the secondary coil at a considerable distance from the primary. The secretion of saliva is increased. *The animal must previously be allowed to recover from the chloroform or no increase will be observed.*[1] The reflex action of the lingual is abolished during narcosis by opium, as well as by chloroform." . .

These three quotations from well known text books on experimental physiology in French, German and English prove that deep surgical anæsthesia is incompatible with the scientific requirements for certain experiments on the salivary glands, information which is especially valuable in view of the singular assertions which were made during the trial in connection with the description of an experiment on the salivary gland of a dog.

[1] Italics ours.

These quotations are taken from "old" text books. Some ultra-modern pro-vivisectionists laugh at any reference made to theories and ideas current before they started their own experiments; but they entirely lack the humour to see the incongruity of the repetition year in and year out of experiments before students which were in existence 30 years ago and which demonstrate simple and well known laws that could be better illustrated by other methods than vivisection.

We need not, however, only go to "old" text books to be taught the dangers—from the purely scientific point of view—of complete anæsthesia for experiments of various kinds. Books recently published and accepted as text books in medical schools, as for instance, *Essentials of Experimental Physiology*," by T. G. Brodie, M.D. (Longmans, Green & Co., 1898), reiterate the same warning.

In the *Journal of Physiology* and other physiological publications vivisectors have made many references to anæsthetics which must be avoided for special experiments. A

recent example of the vivisector's preference for unanæsthetised animals, has been afforded by Prof. Schäfer's application for permission experimentally to drown and resuscitate dogs without anæsthetics. Prof. Schäfer had performed his experiments under chloroform, but came to the conclusion that they had to be repeated without anæsthetics. The permission was granted by the Home Secretary and not withdrawn in spite of a protesting memorial signed by 109 medical men.

5. The Vivisection Act, which offers a very good protection to the interests of the vivisectors, provides the means of exemption from the obligation to produce insensibility in the animal *when the object of the experiment requires it.* It is the objects of the vivisector and not the feelings of the animal which are considered in the granting of certificates exempting the experimentalist from the use of anæsthetics.

6. It is perfectly legal in England to keep a once vivisected animal alive for more vivisections (provided the vivisector holds the necessary certificate) and there is no limit to

the number of operations which may be performed on one and the same animal. Here also it is the *object* of the experiment which is of paramount importance, and it is only when his object has been attained, that the vivisector is under an obligation to kill the animal. Granted that anæsthetics were used and could be used during all actual operations, what about the intervening months of cage-life, when severe wounds are allowed to heal only to be re-opened when the experimentalist sees fit? The intention of the very reasonable request of the law that an animal shall be killed when the object of the experiment has been attained is obviously to protect an animal from being used for more than one series of experiments having one object in view. The trial, which has taught us so many things, also demonstrated that this proviso of the Act is contravened without the slightest fear of punishment, and that one vivisector having finished his series of operations and observations, and acknowledging that he has attained his object, hands the diseased victim of his researches to another

vivisector who performs an experiment of quite a different kind on the same animal.

7. Quite apart from the practical difficulty of keeping animals in a state of insensibility and from the scientific obstacles in the way of vivisectional anæsthesia, the personal attention and discernment which is essential for the maintenance of deep surgical anæsthesia is as a rule not given to vivisected animals. If satisfactory anæsthesia is to be maintained during a vivisection, experience demands that as great, if not greater care and individual study of the subject should be given, than in the anæsthetising of human patients. But we find on the contrary that the least possible care is generally given to the anæsthetising and that the attention of the vivisector is engrossed by watching the effect of the operations, stimulations, poison-injections, etc., which go to make up his experiment. This is still more apparent during demonstrations before students, when the vivisector in most cases lectures at the same time, which adds to his pre-occupation. The preference given to such drugs as curare and

morphia, which with relatively little trouble keep the subject quiet, is easily understood. Neither of these drugs is an anæsthetic, though the narcotising and stupefying properties of morphia offer certain advantages for the convenience of the vivisector.

"Morphia is uncertain as an anæsthetic," writes Mr. J. A. W. Dollar in the *Practice of Veterinary Surgery*. It ought no more to be called an anæsthetic for animals than it is looked upon as such for human beings. Surgeons do not perform severe operations upon patients under morphia.

The "uncertainty" of morphia was further revealed by the *British Medical Journal* of Jan. 14th, 1899. p. 94, where we read: "Morphia does not act as a narcotic in dogs but as a stimulant, large doses causing excitement." Claude Bernard emphasizes the utility of morphia—from the vivisector's point of view—in the following words: "The animal remains sensitive; a touch on the cornea induces the closing of the eyelids; but he is quite still, and lends himself without a movement to the most delicate operation;

. . . . *he feels the pain, but has lost the idea of self-defence.*" (*Leçons de Physiologie Opératoire*, p. 155.)

The most unsatisfactory and obviously unreliable methods of anæsthetising are in vogue in the vivisectional laboratories. All interested in the investigation of this most important subject, are recommended to study the verbatim report of the trial.

One does not need much experience of the operating theatre or of the unavoidable dangers and difficulties inseparable from the work of the conscientious anæsthetist in the administration of anæsthetics to realise the indisputable shortcomings and slovenliness of a method which transfers the responsibility of an intelligent anæsthetist to an *automatic machine.* This is the more apparent if the vivisector and his dog are in one room and the machine in another, and when the vivisector acknowledges the easily comprehensible fact that he cannot always pay attention to the dog.

This was also testified to by *Mr. Sewell* during the trial. (Q. 1794) "Have you

found that dogs under anæsthetics need careful treatment while the operation is going on?—Very."

(Q. 1799) *Mr. Lawson Walton*: Supposing you had the A.C.E. mixture, is that an anæsthetic?—Yes.

(Q. 1800) "Could that be properly used in the case of dogs?—Yes."

(Q. 1801) "Would that, or would it not, in your experience, need careful administration? Very, like all anæsthetics for dogs."

(Q. 1802) "Needing that careful administration, do you think its automatic application by a machine would be satisfactory.—I should think it would be absolutely impossible to give it."

Admissions such as that animals are not weighed, the amount of anæsthetics given not properly measured, and the injection of narcotics entrusted to unlicensed and unqualified attendants do not surprise those who are familiar with the work in vivisectional laboratories.

Many vivisectors state that struggles do not necessarily indicate pain. Dr. G. W.

Crile ought to be an authority on this subject; in describing experiment cxxxiii in "Surgical Shock" on a fox terrier, he says: "In the control experiments, as well as in this, the dog was not under full anæsthesia. In the former the animal struggled on application of the flame." Dr. Crile rightly thinks that full anæsthesia is not accompanied by struggles. In complete anæsthesia all "reflex" acts, with the exception of those necessary for the continuation of life, have disappeared, all muscular movement is suppressed, and the eyeballs can be touched without causing blinking.

8. During the recent trial a vivisector and teacher of physiology acknowledged that he does not generally tell his students the details of the means used to anæsthetise the animals on which he operates, (Q. 354) and this declaration has raised no protest from his vivisecting brethren who share with him the responsibility of the education of medical students. Apart from the lack of humane interest evinced by this neglect, the absence of scientific accuracy is most evident.

Different anæsthetics have widely different effects on the circulation, respiration, secretions, etc., and it is difficult to understand how teachers of physiology, knowing this, can ignore the physiological changes affected by each anæsthetic and narcotic and yet—teach *physiology*.

Frogology

"Nothing is foreign—parts relate to whole:
One all-extending, all-preserving soul
Connects each being, greatest with the least—
Made beast in aid of man, and man of beast:
All served, all serving—nothing stands alone.
Has God, thou fool, worked solely for thy good,
Thy joy, thy pastime, thy attire, thy food?"

POPE.
Essay on Man, III.

FROGOLOGY

All animals in the laboratory are handled like pieces of wood or clay, but the idea that frogs are sentient beings seems to be entirely absent.

'A fresh piece of skin," "a fresh nerve," or "a fresh heart" may be called for many times during an hour, and the required properties of some unfortunate frogs are fetched as readily as a little cotton wool or a piece of chalk. The essential experiments which have to be made by every aspiring student of physiology are, indeed, so firmly based on the existence of the frog, that one might feel inclined to call the first chapters of the science—"Frogology."

A look into any of the current physiological textbooks and handbooks for students will prove beyond doubt to the

interested enquirer that the vivisector who flippantly termed frogs "God's gift to physiologists" had reason, from *his* point of view, to be grateful. "What does not humanity owe to that paragon of animals from a physiological point of view!" exclaims Professor Stirling in his "Apostles of Physiology," and then follows a eulogy on the usefulness of the frog. "Preparation of a frog's muscle," "a single contraction of a frog's muscle," "production of tetanus in a frog's muscle," "examination of the frog's heart," "the action of heat and cold upon the frog's heart," "the nerves of the frog's heart, and their functions," "action of drugs upon the frog's heart," "the effect of muscarine, atropine, and nicotine upon the frog's heart," "the effect of tetanisation of the vagus in the frog," "stimulation of the sympathetic in the frog," etc., etc., are some of the portals through which the neophyte in experimental physiology must wander, before he attains to the shrine where creatures of a higher order are sacrificed to the idol of knowledge.

It is commonly and thoughtlessly believed

that frogs feel very little, and among ten people who would be shocked at a cruelty practised on a cat, we should perhaps find only one who would be aroused to pity if a similar cruelty were practised on a frog. There is a kind of vague idea in the minds of the general public that frogs are used to a great extent for scientific experiments, and, when slightly acquainted with the vivisection controversy, many content themselves without further enquiry with the belief that the matter begins and ends with frogs. The unsympathetic attitude towards frogs has been much strengthened by the assertions of physiologists that most of the frogs experimented upon have had their brains destroyed previously, and that brainless frogs do not feel any pain. This statement is readily accepted by the unsophisticated, who are sure that they would not feel any pain if they were deprived of their brains, and who infer that it must be the same with all other creatures in the universe. The unbiassed enquirer will, to his astonishment, find that the scientific argument is indiffer-

ently built on very much the same kind of analogy.

The theory of *reflex* action, as contrasted with *automatic* action, has been largely studied upon frogs, and has lured many a mind away from the verdict of common sense in this matter. By reflex action is meant a muscular movement which is the response to an external stimulus. "Speaking popularly," writes Sir Victor Horsley in "The Structure and Functions of the Brain and Spinal Cord," "by the term reflex action is to be understood simply the fact that the nervous system provides the necessary apparatus to enable an animal to make response in the shape of a movement when it receives a sensory impression."

The A B C of reflex action is studied upon the spinal cord of the frog. The brain of a frog is destroyed, but *the spinal cord is left intact.* The frog is now subjected to different kinds of stimuli, and the animal's efforts to avoid these are considered as being typical instances of reflex movements. One of the toes of the left foot is

pinched, the left leg is drawn up. A toe of the right foot is pinched, the right leg is drawn up. The skin of the flank is pinched, the leg of the same side is drawn up to push away the stimulus. One of the toes is touched with a heated wire, the foot is withdrawn. One of the feet is allowed to to be immersed in dilute sulphuric or acetic acid; in a short time the foot is withdrawn. Small pieces of paper dipped in acetic acid may be placed on different parts of the body, and the result will be different movements, which all tend to remove the irritant. If the right leg be held whilst the flank of the right side is irritated, the left limb will be drawn up in order to thrust away the irritating object. The animal is poisoned with strychnine: the slightest stimulus applied to any part of the animal will now produce violent tetanic spasms of the whole body. The poison has acted upon the spinal cord so as to produce what is called irradiation of reflex movements.

Physiologists admit that these movements are "complicated, co-ordinated, and purpose-

ful in character,"[1] and that the muscular response is "in no way an irregular series of twitches of the limb muscles, but is a movement similar in nature to those carried out by the frog during its life, and that, when examined, it is seen to tend either to remove the irritating body, to move that part of the body from the irritant, or to remove the whole body."[2]

But in what way do these movements, which are *similar in nature to those carried out by the frog during its life*, differ from those which, under the same circumstances, would be produced in an intact frog? In no way at all. It is true that in an intact frog volition would not have been interfered with, and the animal would be capable of much more complicated efforts in order to escape. But the very fact that a brainless frog can make these "similar" and "purposeful" movements proves that the brain,

[1] "Elementary Practical Physiology and Histology," by M. Foster, M.D., F.R.S., and J. N. Langley, M.A., F.R.S.

[2] "Essentials of Experimental Physiology," by T. G. Brodie, M.D.

although already the "centre on the top of the centres," does not play the same part in maintaining consciousness in the frog as in the higher animals and in man.

In the higher animals these reflexes are not obtained, and it is found that the more complex the cord, the simpler are the "reflex movements." In dogs, cats, monkeys, and in man there are just a few movements which are classified as reflexes *of this kind.*

But on the whole the science of physiology contains no chapter where uncertainty, want of logic, and clear definition are more dominant than in that of reflex movements. You want to know whether a reflex movement is necessarily unconscious or not, whether pain can be a factor in the production of "reflex movement," and, if so, whether brainless frogs feel pain. You search the whole literature on the subject, from Whytt, Marshall Hall, and Pflüger down to the latest treatises, and you find yourself in a labyrinth of empty words and of vague ideas, and you also discover that not one thing, but at least ten different vital phenomena go under

the name of "reflex action." We have heard a physiologist who lectured on reflex action classify the withdrawal of the foot of a brainless frog when touched with a heated wire, the withdrawal of the human foot when it is tickled, walking, manual skill, and—violin-playing as instances of perfect reflex action.

But for the present we are not concerned with this general muddle—one book would not be sufficient to describe that—and we leave it to the reflex violin-player to prove the difference between his art and the movements of a brainless frog.

When vivisectors shall be called upon to answer for their cruel actions, they will perhaps defend themselves by saying that all their skilful operations have been "pure reflexes."

What is of special interest to us now is to know whether the innumerable frogs experimented upon day by day by students taking their first faltering steps into the field of physiology suffer pain or not.

A great many frogs experimented upon

in the laboratories are *pithed*, *i.e.*, the cerebral hemispheres, the medulla oblongata, and the spinal cord are destroyed. If this is done thoroughly the frog is no doubt incapable of feeling pain, and the complicated "reflex movements" have disappeared.

But a great number, if not the greatest, of frogs experimented upon have had only their brains destroyed; their sensory faculties are not impaired, and they do feel the pain inflicted on them. To say that these animals are "pithed" is at least a misapplication of the word. Anybody who opens a hand-book for beginners in experimental physiology can make sure of the terrible nature of the experiments made on frogs, the spinal cords of which have been left intact. From Bernard's classical curare experiment there is a long series of severe mutilations, the interest of which would be spoilt if the spinal cord were destroyed.

The question whether these frogs feel pain or not is a most important one for anti-vivisectionists who do not care only to protect the higher animals.

When we turn to physiologists to get an answer to this question, we get no definite response. "There is some sort of consciousness, but really there is no consciousness," we have heard a celebrated physiologist say.

Sir Victor Horsley is quite irritated at the idea that some people have cared to discuss this matter. He writes ("The Structures and Functions of the Brain and Spinal Cord"): "A vast array of writers have discussed the question as to whether we are to regard the lower animals as possessing, as they say, consciousness, and from this have even proceeded to formulate ideas as to whether they have a soul; while, owing to the remarkable discoveries of physiologists about forty years ago as to the functional activity, exhibited by the spinal cord of a frog when separated entirely from the brain, an animated debate was actually excited as to whether the spinal cord possessed the attributes of the mind. Speculations of this kind, however, are only rendered possible by the unjustifiable application of a metaphysical terminology—

which was originally devised for the analysis of the mental aspect of the most highly complex structure, viz. the brain of man—to the consideration of the simplest reactions of protozoa, small masses of protoplasm ; and I do not propose, therefore, to waste time upon them."

Thus the great Sir Victor superciliously and, we are bound to say, unscientifically passes by the small masses of protoplasm. *Very* small masses of nervous protoplasm may yet possess attributes which baffle the most highly complex structure of man, as, for instance, the wonderful intelligence and delicate sensitiveness exhibited by such animals as bees and ants.

Whether we call these attributes mental or not is not of great consequence, and the "metaphysical terminology" is not at all necessary. So much time is devoted to the tastes of the small but fashionable microbes, that it is indeed surprising that considerations for the feelings of the frog should be treated with such scorn and as waste of time.

There are some great scientists who do not despise the small frog quite so much as Sir Victor Horsley. Among them are M. Charles Richet, Professeur à la Faculté de Médicine, Paris. We quote the following, translated from his "Des Mouvements de la Grenouille Consécutifs à l'Excitation Electrique": "A careful examination of the animal will prove that there is a very great difference between the reflex movement, even if generalised, of a frog without medulla oblongata and the movements of defence and escape, prolonged and repeated, in an animal deprived of the cerebral hemispheres. Are we entitled to call the movements governed by the medulla oblongata voluntary? And if we call them reflex, ought we not to make a difference between them and the simple reflex movements executed by a frog without medulla oblongata?

"Can the movements of defence executed by a normal frog be described as reflex? I content myself with formulating these questions without attempting to answer them."

M. Charles Richet is not quite so sure as his brother scientists of the theory of frog reflexes.

A brainless frog can be made to jump, swim, croak, it will avoid obstacles, and turns over again when put on its back. If it is kept alive for some months it will recover part of the power which it has lost by the removal of its brain. The longer it lives, the more its condition resembles that of a normal frog, and at breeding-time brainless frogs obey the laws of Nature.[1]

Physiologists do not care to discuss whether these frogs, the movements of which are similar to those of living frogs, feel the vivisectional torture or not. But it is only logical to infer that as long as these purposeful and complicated "reflexes" occur, that is, as long as the spinal cord is left intact and the frog tries to defend itself against the injury inflicted, there is a conscious sensation of pain.

In a completely anæsthetised frog, or in a frog the spinal cord of which has been de-

[1] "Manipulations de Physiclogie," par Léon Frédéricq.

stroyed, these movements and all purposeful efforts to escape are entirely abolished.

But the frog is not anæsthetised. When convenient it is immobilised ; this, according to a renowned French teacher of physiology, can be done in various ways, as, for instance, by curare, hot water, fixing with pins, etc.

A great deal has lately been written on the cruelty of feeding snakes with live animals. Some time ago, when visiting the Zoological Gardens, we saw a living frog in the cage of the yellow cobra. The cobra was asleep, and the frog sat in a corner of the cage and stared at the snake, motionless with fear. Some hours later we saw another frog in a physiological laboratory. And we thought that that frog would by far have preferred to be in the cage of the yellow cobra.

The School of Mercilessness

" How can I teach your children gentleness,
And mercy to the weak, and reverence for life,
When by your laws, your actions and your speech,
You contradict the very things I teach ? "

LONGFELLOW.

" We shudder but to dream our maids should ape
Those monstrous males that carve the living hound."

TENNYSON.

The " Princess," a medley.

THE SCHOOL OF MERCILESSNESS

THERE is something in vivisection which makes it abhorred by those who stand foremost morally and spiritually. The outcry against it grows stronger day by day, and just as a Tennyson, a Browning, a Wagner, and a Victor Hugo have felt a deep indignation and contempt for this inhuman practice, there are certain qualities in the character of every man who becomes a vivisector which have led him to take up this kind of "work," and which mark him off as an enemy of ethical progress.

No person of truly refined mind could be a vivisector. Those who volunteer into the army of vivisectors must feel no shame at inflicting pain on the small and the helpless.

What is the influence on the young students who attend vivisectional demon-

strations? We do not hesitate to say that, as a rule, it is distinctly brutalising, that the majority of the students are tainted by the callousness towards the sufferings of the animals which is so clearly demonstrated by their seniors. Very often vivisection is received like a kind of entertainment; there is laughter and merriment, and nearly always there is evidence that most of the students find the proceedings extremely "exciting."

They do not reflect much on the moral side of the question. Medical students have to get on, and be in touch with the latest achievements of science. Those who seek honours or desire degrees in physiology, and who prepare for taking up private research, are deeply impressed with the magnificence of the elaborate apparatus of clever men, dumb animals, and costly instruments. They are filled with the latest theories and debated questions of the science; they pry into the exposed entrails of the animals, and are already preserved against any uncomfortable feelings of pity.

The school of mercilessness is certainly

no school of heroism. We once saw a young man who was most interested in a vivisection; he squeezed the exposed lungs of the dog as if they had been a kind of sponge; he touched as many interior parts as he could reach, and had assumed a lofty scientific mien. During another lecture a few days afterwards, the lecturer asked whether any of the students would be good enough to allow him to demonstrate a little experiment with electrical currents on one of them. No one in the class answered. The lecturer then turned to one of them, which happened to be the young man so bold and scientific the other day, and said: "Will you let me demonstrate this on you?" The young man grew very pale and stammered something. "It is not at all painful," said the lecturer. The young man still hesitated, and looked as if he thought science the most foolish thing in the world. We could not help laughing, a few more joined us, and so the young man, after having been reassured that it was not painful, unwillingly went through his ordeal.

The effect on the laboratory attendants must of necessity be most debasing. We have seen some specimens of these in London and elsewhere, on whose faces the demoralising influence of perpetually witnessing and assisting in acts of cruelty has been clearly marked. Young boys employed in these laboratories are especially to be pitied. For what can they learn there that will help them to become good and unselfish men?

It is degrading for a man to spend a life in acts of cruelty, but it is ten times more so for a woman.

"But surely," people will ask, "*women* cannot approve of vivisection?"

We fear they can and do. Many anti-vivisectionists had hoped that medical and scientific women would work actively to abolish this form of research; but, on the whole, they have been found to put their humane feelings aside, and to accept without protest the scientific gospel of torture.

The woman-vivisector has arrived. She "works" with perfect tranquillity, and is above all anxious to blot out sentiment.

Girls who study medicine, and who do not themselves vivisect or attend vivisections, have all the same to listen hour after hour, week by week, to the details of physiological experiments of the most repulsive kind. There is no other physiology for them; they are taught by clever scientists who disregard any physiology not based on cruelty to animals. They get used to vivisection and to the "necessity" of it.

Even admirers of vivisection may hesitate before the threatening increase in the number of vivisecting women. What a future we have to look forward to!

Will women who have been trained at the vivisection-table become gentle, loving mothers?

An Exact Science

" Some day I shall have a tombstone put over me and an inscription upon it. I want only one thing recorded on it, and that to the effect that 'he laboured to divert his profession from the blundering which has resulted from the performance of experiments on the sub-human groups of animal life, in the hope that they would shed light on the aberrant physiology of the human groups.' Such experiments never have succeeded and never can; and they have, as in the cases of Koch, Pasteur and Lister, not only hindered true progress, but have covered our profession with ridicule."

Prof. Lawson Tait, M.D., F.R.C.S., LL.D.
In a letter to the Medical Press and Circular, May, 1899.

AN EXACT SCIENCE

Some gleanings from our physiological notes :

" Although we find this in our textbooks, there is not the slightest evidence that it is true.

" One can never tell till one has stimulated what is going to happen. The effects are very uncertain.

" That experiment, however, requires further repetition and confirmation in the light of our present knowledge.

" Men of good and established reputation have here come to diametrically opposite results.

" They of course came to different conclusions.

" It is of course varying with the authority which describes it.

"It has a very different effect in different animals.

"In those experiments we are using very strong stimulation. So that the conditions are not at all normal.

"The question is at present in a very unsatisfactory state.

"But we must remember that no observations made on the brain when the skull is opened can be applied to the brain under normal conditions.

"Nearly all the observations made have taken place under abnormal conditions, and are consequently not correct.

"Before you can succeed in isolating the brain from all outer structures, the animal dies.

"The electrical excitation must of course be a very abnormal form of producing these results.

"This point must be of a fundamental importance, but we have yet no knowledge upon this subject.

"We must study this subject in the monkey or in man. It is of no use to study

it in an animal like the dog, because it can never be compared with man.

"The inner surface of the heart is very sensitive, the outer insensible to touch.

"Introducing a cardiac sound in the heart of a horse. No pain whatever (!)

"Made on unanæsthetised horses, so that the conditions were normal.

"All these speculations with regard to the inner work in the muscles are more or less uncertain, but we have to go on till we find some that suit all our experiences in the laboratory.

"We cannot reproduce the actual conditions in life.

"This is one of the many disputed physiological points."

Where do the Animals come from?

"Berlin, 24th Feb., 1883. . . . I have always shared your indignation against the excesses of vivisection ever since they have been known to me, and although I hold no special administrative power which would enable me to exercise a decided influence in this direction, I should already have endeavoured to bring about the diminution of experiments which involve cruelty to animals, if the amount of working power which is still left to me were not so inadequate that I have already been obliged to relinquish official duties devolving on me."

VON BISMARCK.

Translated from a letter to Ernest von Weber,
Published 1883 in Dresden.

WHERE DO THE ANIMALS COME FROM?

Who brought the dog, that is fixed to the operation-table ready for the vivisection, to the laboratory? Who sold him to the tormentors for thirty pieces of copper?

Think of the weary days and hours spent in vain howling and crying for freedom before the horrible experiments begin. Think of the terror he must endure, tended by the merciless attendants of vivisection. Perhaps he has had a happy home and known nothing but kindness all his life—to-day there is only the rack and the knife for him. He can do nothing to ward off his terrible fate. He is now nothing more than some kilos of dog-flesh, purchased for the needs of the inferno of animals.

Owners of dogs and cats ought to pay attention to the revelations of how the living laboratory-material is procured, now and

then published in the press. The Constantinople vivisector has no difficulty at all in finding his canine material, which he returns to the street, tortured but still alive, when he has done with it. From Germany and France there are many true stories of how cats and dogs have been stolen for the purposes of vivisection. The recent scandal in Chicago over the many dogs stolen and sold to the University, where they were found by their anxious owners who had succeeded in getting legal permission to search for their lost pets, throws light upon the supply of animals for scientific torture.

We have heard two students, studying physiology, discuss the efficacy of a cat-trap belonging to one of them.

Every lover of animals who enquires into the number of lost cats and dogs in London must be alarmed. The homes for these animals are doing excellent work in withholding a great many from the most terrible fate of all; but in spite of that, we are convinced that hundreds of lost animals find no other home than the vivisector's torture-

trough. It has lately been discovered that the police in Oxford were selling stray dogs to vivisectors, and we have not been re-assured that the London police do not do the same. On December 18th, 1902, Mr. J. G. Weir, M.P., asked some questions in the House of Commons as to the methods of the police in dealing with lost and stolen dogs. In a communication of January 14th, 1903, from the Secretary of State to Mr. Weir (published in the *Zoophilist* of February 2nd, 1903) it is stated that:

"In the case of stray dogs the proceeds of any sale by the police are authorised by Sec. 18 of the Metropolitan Streets Act, 1867, to be carried to the credit of the Police Fund.

"The Secretary of State has considered, in consultation with the Commissioner of Police, your suggestion that dogs held by the police in connection with a charge of theft should be sent to the Dogs' Home at Battersea, but he regrets that this does not appear to be practicable.

"As regards the possibility that dogs sold by the police may be used for the purposes

of vivisection, I am to point out that the statutes authorising the sale do not lay down any restrictions as to the persons by whom, or the purposes for which, the dogs may be bought, nor do they empower the Secretary of State to do so, and he does not think that it lies with him to attempt to go further than the law in this matter."

There is, therefore, not the slightest guarantee that the police are not rendering service to science at the same time as to the Police Fund.*

Rabbits and guinea-pigs can be bought only too easily; in many places they are reared and fed on a large scale, for the sole purpose of being experimented upon.

The Moloch of vivisection is voracious; he is not satisfied with a few victims. Many people who carelessly lose their animals, or who thoughtlessly pass by lost dogs and cats in the streets, believing that a policeman or somebody else will take care of them, would not leave the little miserable strays unaided, if they had just once been inside the scientific chambers of horrors.

* This state of things seems now to be remedied. Judging from a letter which appeared in the "Standard," of April 14th, 1904, signed by F. E. Pirkis, Chairman, National Canine Defence League, the sale of stolen dogs by the police will now be discontinued and such dogs will henceforth be sent to the Battersea Home for Dogs, and other specified places.

The Barren Tree

" It is my supreme hope that when, with God's help, our Anti-Vivisection controversy ends in years to come, long after I have passed away, mankind will have attained *through* it a recognition of our duties towards the lower animals far in advance of that which we now commonly hold."

FRANCES POWER COBBE.

THE BARREN TREE

ARE any of the experiments which we have witnessed likely to alleviate the sufferings of mankind? We put this question to those who imagine that some good to humanity will one day arise from the darkness of the laboratories of vivisection, and make the world healthier and better.

There is not even the slightest pretence that experiments like these are made to further medicine; they are the offspring of science *pur et simple*, and their makers scorn the idea of any bondage to the healing art. It is now long ago since they declared that their science was a *distinct* science, and that they had the same right to pursue it without any claims to immediate utility as has the astronomer, the geologist, and the physicist.

It is "knowledge" they seek, and the only

knowledge which they value is bought by tormenting the sub-human races.

Their science is like a distorting mirror, where the fair face of Nature is changed into a series of hideous contortions.

They often talk as if the monopoly of absolute accuracy and perfectly correct representation of facts of necessity had been given to them because of their strictly experimental methods. But when we scrutinise the grand castle of their science we find that it rests on no solid ground, and that parts of it are continually falling to pieces and built up again on the same slough of deception.

The unsatisfactory state of the science is sometimes frankly admitted, though no other path is seen than more experiments on animals. In the preface to the "The Physiologist's Notebook," a summary of the present state of physiological science, for the use of students, by Alex. Hill, M.A., M.D. (London, 1893), we read: "The Notebook deals with the arguments of physiology, for it is as well that the student should, from the

outset, recognise that the subject, although it has made rapid strides during the last twenty years, is still in an immature and transitional state, and that many most important issues can only be summed up as leaving a balance of evidence on the one side or the other—a balance which subsequent investigation may possibly disturb."

As long as the science is built on torture of animals it will remain in an "immature and transitional state." It does not aspire to the higher regions of thought, and the words of Huxley ("Life of Hume") seem singularly inappropriate: "The laboratory is the forecourt of the temple of Philosophy, and whoso has not offered sacrifices and undergone purification there has little chance of admission into the sanctuary." For whatever vivisectors are, they are not philosophers, and the materialism engendered in their laboratories does not prepare them for the temple of Philosophy.

They have to create a new and spiritualised vitalism before they can grasp any vital phenomena, for, as Dr. Lionel Beale writes

in his "Vitality," "We are not machines, we are not governed by, or the results of, chemical and mechanical changes. Our life is not the mere outcome of chemical and mechanical forces." And the old investigators, who spoke about the undefinable spirit of life, were much nearer the truth and the sanctuary of lasting and sacred thought than the modern sellers and buyers of theories, based on matter, and matter only, and baptised in the blood of agony.

The experiments which have been described in this little book are only instances of one part of the appallingly extensive system of exposing the sub-human races to torture for the sake of a "knowledge" that debases the intellect, and a medical science that thinks that the body can be kept alive by killing the soul.

For the sake of the innocently tormented, for the sake of the unborn human race going to receive this cursed heritage, for the sake of the great belief in a life everlasting of mercy and love, this infamous practice must be put an end to.

PRESS NOTICES.

"The book comes opportunely. It is the tender and gentle work of two humane ladies, who have studied physiology in London in order to raise some outcry against the shocking cruelties practised by our scientists in the cause of what they call humanity."

Daily News.

"The intolerable cruelty which the authors of the "Shambles of Science" witnessed in the laboratories . . . . . and they are no better and no worse than any others—is sufficient reason for the prohibition of this detestable practice, for this cruelty is not more characteristic of these demonstrations than their futility."

Morning Leader.

"This book is a serious and weighty contribution to the public knowledge of its subject."

Scotsman.

"The directness of expression and the reasoning of the authors are so forcible that the Anti-Vivisection ranks are pretty sure to get new recruits as a result of the publication." Scottish Reformer.

"This ably-written pamphlet contains extracts from the notebooks of two students attending lectures on physiology in London. . . . Absolutely necessity alone can justify the perpetration of such disgusting cruelties as are recorded by these two 'very attentive students.'"

Manchester Courier.

"The little book is a weighty indictment against the practice of vivisection, and cannot fail to carry conviction to the minds of the hitherto unconvinced."

Manchester City News.

"If this exposure of a barbarous method of acquiring intelligence is instrumental in subduing the practice, the authoresses of the "Shambles of Science" will have earned thanks." Liverpool Mercury.

". . . . this very forcible indictment of vivisection."
Newcastle Chronicle.

"If a stricter supervision result from the reading of this book, its existence will not have been a vain one."
Dundee Courier.

". . . . It is ably written, and absolutely free from that vituperative species of censure which is so common to Anti-Vivisectionists." Weekly Irish Times.

". . . . This book . . . makes, it must be said, an effective weapon for those who hold Anti-Vivisection opinion. The authors' cleverness includes the grace of humour." Cork Examiner.

"The operations described in this book would be revolting enough even if great and important results were obtained, but the contention of the writers is that a very large number of them were quite barren of any useful result. . . . One can only feel that such a vast sacrifice of innocent animal life amid such indescribable suffering is wholly unjustifiable." Oxford Chronicle.

"There is no needless or sentimental insistence on the sufferings of the animals, and the book can be read without too great a shock by all but exceptionally nervous and sensitive people. The writers have been wise in their moderation, for as it stands their book is undeniably impressive, whereas if they had filled it with what vivisectors would call hysterical shriekings they would have gone far to defeat their own object." Court Circular.

". . . . "The authors seem to have established the fact that needless and useless operations involving horrible torture do take place in spite of legal restrictions."
Ladies' Field.

"A work that will appeal deeply to the feelings of dog lovers, who regard with horror the investigations of vivisection as practised upon canine subjects."
Illustrated Kennel News.

"A spiritualised insight into vivisection has long been needed, and at length we have it. Few things more revolting are in type than this volume, and yet it is written with a true literary instinct and a rare depth of feeling. It is to be hoped this book will have a very large circulation, and if it has, it is bound to materially influence the course of the Anti-Vivisection movement."

Labour Leader.

"The authors prove beyond question that vivisection, from the point of view of scientific progress, is bankrupt, and that its horrors are sterile." The Star.

"We have not reproduced so much as a half of the direct first-hand evidence furnished in the book before us, but one-tenth of it would be enough to show that the administration of the medical department of the London University is in need of drastic reform, and that the Home Office for some time past has been shamefully neglectful of, or culpably disloyal to, the spirit of the Act relating to vivisection, which is absolutely worthless unless the Home Secretary does his duty." The Sun.

"This book should be read by all lovers of animals and is but one more proof of the cruel tortures to which animals are sacrificed for the love of *pseudo science*. . . . . These books are dreadfully harrowing to any who possess hearts, but the battle against vivisection cannot be fought unless the truth is known, and the sooner it *is* known the better for man and beast alike." Westminster Mail.

"I do not like the title, because vivisection is *not* 'Science,' but the modern counterpart of the Inquisition, but the book entitled the 'Shambles of Science' . . . . ought to be read by all who are concerned to know what is being done in English laboratories."

Weekly Times and Echo.

". . . . This book should do much to throw light on the indescribable torture and misery inflicted upon poor dumb animals, under the plea of adding to "scientific knowledge." . . . . Christian Age.

"We have here a serious attempt to show that undue cruelty and careless negligence is often practised upon animals who are supposed to be undergoing 'painless experiments' in the interest of medical science."

Church Bells.

"Here is a volume which brings inferno up to earth. The chamber of horrors hidden behind the veil of the scientist's laboratory in the biological sphere, is opened up to view as never before. And this Satanic Apocalypse is utterly unrelieved by rhetoric. Nothing is left out that can horrify; nothing is softened or minimised; but nothing is emphasised or intensified by adjective or epithet. . . . some very disturbing queries are propounded by the two women who have seen so much in the physiological schools."

Christian Commonwealth.

"If the whole of the evidence offered by these two ladies be true, London vivisectors are culpably cruel; if a quarter of it be true, they are cruelly careless."

Tablet.

"The authors write in a mordantly sarcastic style, which is far more effective than if they entered into elaborate detail." Catholic Times.

"We could not repress our indignation as we read this record of heartless torture in the name of science, and we are sure that those who have not lost the virtue of being merciful will hope, with us, that the realistic *exposé* of vivisection herein given may help towards creating a strong public feeling against a practice which is as degrading as it is cruel and un-Christian." Friend.

"All convinced Anti-Vivisectionists should avoid this book if they wish to have any peace for the rest of their days on earth. It should be deeply studied by all Members of Parliament who think the law in respect to vivisection in this country is of the least use to protect animals from torture." Homeopathic World.

"This book is certainly one which will make and leave its impression. It is, in our opinion, the most telling blow yet

delivered against the vivisecting school. It is what has always been wanted—namely, an account of what vivisection really is as witnessed by those inside the laboratory. It is a true account, written in terse, forcible style, with biting irony and grim humour." . . . .

The Herald of Health.

"This striking book differs from most Anti-Vivisection publications in a very important particular. It is not a record of extreme and occasional experiments, but details the every-day experiments made for the edification of medical students. . . . At these they saw cruelties which quite justify the title of the book."

Vegetarian Messenger.

"We hope this book will be universally studied. It will be a revelation to many, and we are satisfied that once the common people become aware of the barbarities that are carried on under the name of science, they will refuse such things to continue, and no longer accept the *ipse dixit* of men trained under such auspices." . . .

Scottish Health Reformer.

"Nothing could be more straightforward than the method of attack which these intrepid women have made upon the system of teaching physiology in our medical schools, and we think that the most special of special pleaders will be hard beset to explain it away. We should rejoice to believe that this book may do the same service for the humanity of the 20th century that 'Uncle Tom's Cabin' did for that of the 19th." . . . Theosophical Review.

"The story of what they have seen is, as we say, a sad one. It is worse than that . . . It is as though one got a glimpse into hell: and that would be so even though it could be proved that the knowledge gained was helpful to mankind." Light.

". . . the book is calmly written and far removed from any taint of fanaticism." Two Worlds.

". . . We cannot stop vivisection, but we can do a great deal to cut off the supply, if we make a conscience of knowing what becomes of every animal we ever possess.

If we cannot keep them, we can at least give them a merciful death. Meanwhile we can say with these brave ladies, 'to fight against vivisection is to fight against the principal fortress of the foe of idealism and spiritual evolution.'"

The New Age.

". . . This volume ought to enlighten the British parent—unless he or she desires to remain in total ignorance on the subject—as to the sickening experiences which sons and daughters taking up a medical career have to go through if at all wishful to attract notice and rise in their profession." "NATURALIST" in Modern Society.

"Well, here we seem to get the truth, the whole truth and nothing but the truth, set forth in all sincerity, from a prejudiced point of view no doubt, but with a simplicity of fact and detail unadorned, that carries eloquent condemnation certainly, and not commendation, in every phrase." . . . Brighton Standard.

". . . . That needless infliction of cruelty on any sentient being is a crime against all that is noblest in man will be readily admitted by every physiologist worthy of the name; and one does not require to be an Anti-Vivisectionist to wish that the 'Shambles of Science' may be widely distributed." Edinburgh Evening Dispatch.

". . this most interesting and instructive work." .

Isle of Wight Advertiser.

". . . A remarkable contribution to the literature of vivisection." Nottingham Guardian.

". . . Cannot fail to prove of the deepest interest to all humanitarians and lovers of animals."

Preston Herald.

". . . It discusses unpleasant things with as little of the objectionable element as can possibly be done with."

Bristol Mercury.

"The disclosures are painfully startling, and cannot but materially strengthen the cause of Anti-Vivisection."

Leicester Daily Post.

". . . . The book is the most readable one we have come across in connection with the Anti-Vivisection agitation. The writers . . . . have apparently been behind the scenes. . . . . They are well up in the technique of the subject." Brighton Gazette.

". . . . A fascinating book, which should have a powerful influence by reason of its calm and lucid presentment of episodes which are in themselves enough to enchain the attention by their very horror. . . . It is excellently arranged, full of good sense and sound reasoning." . . . Croydon Advertiser.

". . . . This is one of the most eloquent books we have read dealing with vivisection. . . . . The book makes revolting reading, but therein lies its strength and message." Teddy Ashton's Northern Weekly.

". . . . The two writers present a series of veritable human documents in which they give instances and examples of the work of the vivisectionist, and say what they have to say without violence, and in a quiet but most effective manner." Wigan Observer.

[Extract from an article in the Abolitionist, Dec. 15th, 1903.]

"To speak of the establishment of the general credibility of the book by the recent trial will seem somewhat superfluous to those who have read it carefully and are competent to pronounce an opinion from internal evidence on the trustworthiness of the contents. But it is worth noting that the impression of perfect veracity produced by the record of what the authors saw is corroborated by the effect of the trial in testing a single record, to discredit which every effort was made by the vivisectors and their allies, but which emerged undamaged from a cross-fire of hostile cross-examination, an evidently honest and conscientious attempt to record actual experience. . . . . What we wish to draw attention to is the fact that the Swedish witnesses adhered without faltering to the account they had

given, and quite unconsciously brought out, by their unstudied and straightforward answers to long and severe cross-examination, that the chapter in the "Shambles of Science," of which the experiment in question was the subject, was not only not an exaggerated or over-coloured picture of what they saw; but that their actual experience, to which they adhered unshaken, would have justified a more detailed, and more highly coloured account. That is to say, in one out of the long series of demonstrations which these eye-witnesses recorded in their book, their record has been proved in open court to be less extreme, less highly coloured than their experience justified." . .

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